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UNIVERSITY OF CALIFORNIA—COLLEGE OF AGRICULTURE.  
AGRICULTURAL EXPERIMENT STATION.

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REPORT  
OF THE  
VITICULTURAL WORK  
DURING THE SEASONS 1887-89,  
WITH  
DATA REGARDING THE VINTAGE OF 1890.  
PART I. RED-WINE GRAPES.

---

PREPARED UNDER THE DIRECTION OF  
**E. W. HILGARD,**  
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By **L. PAPARELLI,**  
Instructor in charge of Viticulture and Olive Culture.

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REPORT OF THE PROFESSOR OF AGRICULTURE AND  
DIRECTOR OF THE EXPERIMENT STATIONS

TO THE

PRESIDENT OF THE UNIVERSITY.

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## EXPERIMENT STATIONS OF THE UNIVERSITY OF CALIFORNIA, 1892.

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### CENTRAL STATION (Berkeley, Alameda County).

- E. W. HILGARD, Ph.D., LL.D. (Professor of Agriculture), Director and Chemist.  
E. J. WICKSON, M.A. (Associate Professor of Agriculture, Horticulture, and Entomology), Superintendent of Agricultural Grounds.  
E. L. GREENE, Ph.B. (Associate Professor of Botany), Botanist.  
R. H. LOUGHRIDGE, Ph.D. (Assistant Professor), Agricultural Geologist and Agricultural Chemist.  
C. W. WOODWORTH, M.S. (Assistant Professor), Entomologist.  
M. E. JAFFA, Ph.B. (Instructor), First Assistant Chemist in Agricultural Laboratory.  
L. PAPARELLI, Lic. Agr. (Instructor), Assistant in charge of Viticulture and Olive Culture.  
GEORGE E. COLBY, Ph.B. (Instructor), Second Assistant Chemist in Viticultural Laboratory.  
C. H. SHINN, A.B., Inspector of Stations.  
EMIL KELLNER, Foreman of Station Grounds.  
F. T. BIOLETTI, Foreman of the Viticultural Cellar.  
A. V. STUBENRAUCH, Clerk to the Director.
- 

### SIERRA FOOTHILL STATION (near Jackson, Amador County).

- R. C. RUST, Patron; Jackson.  
GEORGE HANSEN, Foreman; Jackson.
- 

### SOUTHERN COAST RANGE STATION (near Paso de Robles, San Luis Obispo County).

- GEORGE R. ADAMS, Patron; Paso Robles.  
R. D. CRUICKSHANK, Foreman; Paso Robles.
- 

### SAN JOAQUIN VALLEY STATION (near Tulare City, Tulare County).

- A. J. PILLSBURY, Patron; Tulare.  
JULIUS FORREB, Foreman; Tulare.
- 

### SOUTH CALIFORNIA STATION (near Pomona, Los Angeles County).

- RICHARD GIRD, Patron; Chino.  
K. McLENNAN, Foreman; Pomona.
- 

### VITICULTURAL STATIONS (under private auspices).

- WEST SIDE SANTA CLARA VALLEY STATION; Cupertino, Santa Clara County. John T. Doyle, Patron; Menlo Park.  
EAST SIDE SANTA CLARA VALLEY STATION; Mission San José, Alameda County. John Gallegos, Patron; Mission San José.  
FRESNO VALLEY STATION; Fresno City, Fresno County. E. B. Rogers, Patron; Fresno.

## LETTER OF TRANSMITTAL.

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*Prof. MARTIN KELLOGG, Acting President :*

SIR: I transmit herewith a report on a portion of the viticultural work done at the Station since the publication of the last special report on the subject, in 1886, excepting, of course, that portion relating to "Experiments on Methods of Fermentation," issued in 1888, as a separate pamphlet.

The causes of the delay in the publication of the record herewith given were, in part, the impossibility of putting it in shape without competent assistance, after the duties of Director of the Experiment Stations had devolved upon me, together with the work of establishing a number of new Culture Stations. The subject of viticulture and vinification is a specialty in which experts that possess, at the same time, the needful scientific and literary qualifications, are few and difficult to obtain. Had I not been able, fortunately, to secure the services of Assistant Paparelli for this branch of the work, the document here transmitted would not now be ready for the press, most of the compilations of data, as well as the discussions, having been made by him, in part with the aid of Assistant Colby. The multitude of other duties pressing upon me prevents my exercising more than a very general supervision over the viticultural work, but I consider it well provided for in the hands of the present assistant in charge. The chemical work has been almost entirely done by Assistant George E. Colby.

While in some respects this delay is to be regretted, it is nevertheless true that all agricultural experimental work requires, as an essential condition of reliability, the extension of observations over a number of years; and this is especially true of the wine industry, on account of the well-known great variations in kind and quality of successive vintages. It is only by often repeated verification under different seasonal conditions that the seasonal accidents, as variables, can with certainty be separated from the true constants inherent in the several varieties under trial. As the result of comparisons embracing a number of years in each case, the results here given are therefore entitled to considerably greater weight than if published sooner, and may, with more certainty, serve as a basis for practice.

Another reason why publication has not been actively pressed was the depressed commercial condition of the wine industry, which presaged that any publication designed mainly to show in what direction improvements should be made under a normal state of affairs, would excite little interest, and would be consigned to oblivion before the hoped-for revival. Of the latter, there appears at present to be a definite prospect, while the conviction that in the future quality rather than quantity must be attended to in our policy of production, is steadily gaining ground. It therefore seems timely to bring out as rapidly as possible that portion of the report that will be of the greatest interest to the greater number, namely, the portion referring to red wines, both dry (clarets and burgundies) and fortified (ports), leaving for elaboration and publication

at the earliest date possible the part referring to white wines. The work on the vintages of 1890 and 1891 will thereafter be prepared for publication in full; in the present report only the analytical data of the former vintage are given for the sake of comparison, since the remainder of the record is not yet complete.

Respectfully,

E. W. HILGARD,  
Director of the Experiment Stations.



## PART I.

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### GENERAL OBJECTS AND PLAN OF THE VITICULTURAL WORK.

By E. W. HILGARD.

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While the plan of the Station work with respect to viticulture has been explicitly stated in former reports, and there has not appeared any reason for a change of plan since the last report was published, such statement might now be omitted but for the length of time that has elapsed, and the probability that in many cases the earlier reports have disappeared; while to many, the whole subject may be entirely new at this time. It is therefore expedient to repeat the former statements, with such modifications as experience has shown it to be desirable to make in our methods:

"The plan adopted in this matter is in conformity with my view, shared by the best vintners in the State: that among the first necessities of the present situation of California wines in the world's market, is the establishment of more definite qualities and brands, resulting from a definite knowledge of the qualities of each of the prominent grape varieties, and of their influence upon the kind and quality of the wine, in blending before, or, as the case may be, after fermentation; of the treatment required by each in the cellar during the time of ripening; and finally, of the differences caused by difference of location, climate, etc., as well as by different treatment of the wines themselves.

"To this end, a definite knowledge of the character and special wine-making qualities of each kind of grape serving in the preparation of wine is indispensable. In the wine-producing countries of Europe this knowledge has been acquired by long experience; and chemical investigation has subsequently, in a great measure, ascertained the natural conditions upon which the attainment of certain results in wine-making depends. The principles thus evolved can be applied to new conditions, such as those existing in California, and thus save, to a great extent, the laborious and costly experimenting which has been gone through heretofore, by formulating into generally intelligible rules the knowledge which otherwise usually remains the trade secret of a few experts.

"The first step to such knowledge is to obtain a definite idea of the material to be treated. Clearly, what is needed is that first the must, and then the corresponding wine of the more important grape varieties, should be made the subject of detailed investigation, and that the wine should have been produced from the must under definite, or definitely varied conditions, with absolute certainty of the purity of materials, as well as of the precise manner of operating in each case.

"In an experimental laboratory, the qualities operated upon are of necessity relatively small; and it is highly important that allowance be made for this circumstance, as well as for other points in which the "wholesale" practice must always differ from the small-scale one.

Nevertheless, we are thus enabled to obtain a very close estimate of the results obtainable from a given grape variety on the large scale, and of the part that each will play when blended either before or after fermentation.

"It should be fully understood and remembered that while peculiarities and defects shown by analysis are perfectly definite indications as to the conditions that *must* be fulfilled in a successful blend, yet analysis cannot as yet take cognizance of the delicate and almost intangible flavors, or "bouquets," which must likewise be made to harmonize, in order to satisfy a cultivated palate. To that extent the determination of the proper blends must always remain with the expert wine-taster; but the work of the latter is immensely facilitated by being informed, through the analysis, of the prominent chemical peculiarities which in any case must be taken into consideration, and which ordinarily are left to laborious and more or less blind guessing or experimenting.

"Even the most cursory consideration, however, shows that this cannot be the work of one or even a few years; but, like all other agricultural experiences and experiments, must be extensively repeated in order to become the basis of general practice. The same grape varieties grown in different localities, and in different years, will differ materially in their composition; and it is only by extended comparisons of these through a number of years that the accidentals can be definitely segregated from the essentials. Hasty generalization, based upon limited experience, is the bane of all experimental work, especially in agriculture."

In the earlier stages of this work a great deal of labor was bestowed on the examination of wines sent in by producers. In a large number of cases important results were thus obtained, owing to the special intelligence and care of the senders; but in a considerable proportion the results were extremely unsatisfactory, partly owing to the confused nomenclature and incorrect determination of the varieties from which the wines had been made, partly because of the very faulty methods of wine-making then prevailing, which rendered the product so different from what it would have been under correct treatment, that no valid conclusions could be drawn from its examination, whether chemical or gustatory. It was then attempted to gain better results by getting the grapes themselves from the growers and making them into wine in the laboratory, and the first thoroughly reliable results were thus obtained. But there arose great difficulty in getting the fruit picked at just the right stage of maturity during the hurry and pressure of wine-making in a large establishment; moreover, the transportation was found to involve not only heavy cost but frequent partial or total loss from injury to tender-skinned grapes in the rough handling they underwent before reaching the laboratory.

*Stations under Private Auspices.*—It was then that under the generous initiative of Mr. John T. Doyle, of Menlo Park, followed by Messrs. E. B. Rogers, of Fresno, and John Gallegos, of Mission San José, the establishment of "experimental plots" under private auspices, planted with well-identified and important varieties, was begun and pursued with excellent results for several years. As will be seen from the record hereinafter given, the bulk of the exact information we now possess regarding the peculiarities of prominent varieties of grapes in different localities, have been the result of the work in these experimental plots established under private auspices; and among these, more particularly,

the contributions from the "Cupertino Experimental Plot," under the patronage of Mr. Doyle, have been very full and important, as will be seen from the record.

The practice with respect to these experimental plots has been, that while the cultivation and general care of the vines devolved upon the patrons offering their use for experimental purposes, they were visited several times prior to the vintage by either the Director or some other competent person, in order to observe the growth and development of each variety, a full record of these observations being kept. Toward vintage time a suitable person was sent to remain on the spot and record the progress of maturity, and also to superintend the picking of the crop when at the proper stage. The mature grapes were then packed in "basket crates," such as are used for shipment of fresh fruit to the East, and then shipped mostly by express, since conveyance by ordinary freight trains would in most cases be too slow to permit the delicate-skinned and juicy wine grapes to arrive in a sound condition. It was found that in many cases even the relatively gentle handling and rapid conveyance by express would not carry certain varieties safely when in the proper condition for wine-making—that of complete maturity. The very conditions that must be fulfilled in a true wine grape, render its conveyance to any considerable distance without injury extremely difficult. As a matter of fact, almost every lot of grapes received at the laboratory has had to be picked over, in order to cull out as closely as possible all damaged, partially fermented, and moldy grapes, together with those which, as the result of coulure or other early injury, have remained only partially developed, or have become wholly or partially dried in that condition. That this tedious and laborious process was not always successful is painfully apparent from the frequency with which abnormal fermentations began to develop shortly after the first rapid fermentation was over, resulting, in the small quantities necessarily used, in frequent almost total loss of the experiment.

*Limitation of Experiments as Regards Quantities Used.*—This limitation of quantity is one of the most serious drawbacks upon our work and its comparability with large-scale practice. The limitation is, however, unavoidable, unless there were at command an amount of financial means, which there is not the slightest prospect of being supplied. For large-scale experimentation of this character would require the establishment of several well-equipped and extensive wineries for that express purpose, in each of the several wine-making regions of the State, together with extensive vineyards, in which each of the two hundred or more varieties now under trial in the State could be grown in quantities sufficient for such large-scale work. Those who have established wineries and vineyards embracing many varieties, will readily appreciate the enormous cost and practical difficulty involved in such a scale of experimentation. It is certainly quite useless to attempt their establishment within this century; and I am satisfied that the results obtained would be so largely vitiated by the impossibility of the exact management of such complicated establishments that the heavy cost would not be repaid by them.

In fact, the main points now to be ascertained are of so elementary a character that even small-scale experiments, carefully conducted, can serve with certainty to eliminate from consideration, for practical pur-

poses, three fourths of all the uncertainties existing as regards the adaptation of given grape varieties to the production of certain classes of wines in given districts. Except in a few localities, the wine industry of the State is still in the elementary condition in which the discriminations elsewhere made in the later stages of the development of wines are hardly thought of. The broad question to be solved is, *What classes of wines can certain regions of the State undertake to grow at all?* And this question can be solved with certainty, in the vast majority of cases, by small-scale experiments, even if the samples made should not be available for observation for more than eight months after fermentation. A practiced palate judges, without difficulty, of the possible development of a wine three or four months old. At six months most of our wines pass out of the grower's hands, in accordance with the wine-dealer's judgment and valuation, and cease to interest him.

If, then, our small-scale experimentation in wine-making—the only practically possible mode of operating in so vast a State, where so many varieties are under trial—can be made to represent even approximately the character and quality of wines at the age of from six to eight months, it will have rendered the wine interest of the State a service that can, within reasonable limits of time, be rendered in no other way. *It serves to indicate with perfect plainness what trials it may be advisable to make on the large scale, and what others it is idle to think about.* If not conclusive evidence in all cases, it is assuredly in the great majority so plain that he that runs may read. It renders unnecessary the huge experimental establishments proposed by some, and relegates to private trials, on whatever scale may be thought advisable, such experiments as promise reasonable success.

*Private Trials with Station Aid.*—That such private large-scale trials should have all the assistance that can be given by the Station, both in the first fermentation and the subsequent treatment and examination of the corresponding wines, is a matter of course, and has been frequently suggested by us; but thus far few have availed themselves of such aid. This coöperative experimentation is carried out regularly, with excellent results, in connection with nearly all the experimental cellars established in Europe, where, besides the small-scale experiments made by the Director and assistants at the Station, corresponding large-scale experiments suggested by the former are carefully conducted in the wineries of the region in which the Stations are located. In the south of Europe such experiments refer particularly to the difficulties that so commonly occur in the fermentation of musts of high sugar-contents and low acidity, under the unfavorable conditions of high temperature that exist during the vintage season, conditions precisely similar to those occurring in many of the wine-making centers of California. Even such experiments cannot always be expected to lead at once to the solution of *all* difficulties, for the reason that conditions surrounding them are so complex, and often vary so much in different years, that several seasons may sometimes be required before perfectly definite results can be reached. But when such trials are systematically made, under exact supervision, the conditions can at least be definitely ascertained, and from them suggestions for the future can be deduced. Under ordinary circumstances the results are usually obtained more quickly. Certainly, the blind experimenting that has been so largely indulged in heretofore, without any definite ascertainment of actual

facts, cannot hope to be successful except occasionally, by accident, and with a much heavier expense in the way of useless work and appliances than would be incurred in a well-conducted, systematic experiment under expert supervision.

*"Art" vs. Science.*—It has been alleged that "wine-making is an art, and has nothing to do with science." It would be sad for this important industry if this were in any sense true, and if at the end of the nineteenth century it had still failed to participate in the advance of all other industries—from the making of indigo and madder color from coal to that of butter and cheese, and even the feeding of hogs—to the benefit and dignity of a scientific basis. The allegation is simply untrue. It is true that good wines have been made for a long time in certain regions or localities, upon no other basis than long-continued experience; but it has cost centuries of time and floods of bad wine before that point was reached, and even now the vast majority of the wines made in the old wine districts of Europe is, according to the unanimous testimony of both merchants and scientific experts, *very* far from being the best that could be made from the materials given. Unless California wine-makers are willing to go through the same protracted performance that has been required to enable Europe to protect its choice vintages, they should avail themselves of the *principles* that have been deduced from the experience of centuries in the Old World, as formulated by the exact observations of experts. It is idle to pretend, at this late hour, that blind imitation is to be preferred to the intelligent application of principles that hold good under all circumstances, and that we have only to plant the same vines and follow the same modes of operating practiced in the Old World, in order to produce similar vintages, when the climatic conditions under which we operate are radically different, as are also our soils. The advocates of such a policy have much to learn from the history and development of the beer industry, which, from a mere tentative art, dependent upon personal skill and accidental conditions, and supposed to be practicable only in certain climates, has been transformed into a definite manufacturing industry that can be carried on anywhere, with proper appliances and the knowledge of the principles developed by scientific study.

So far as the application of scientific study to wine-making is concerned, one single illustration may suffice. Since it is definitely known that a sound vinous fermentation depends essentially upon the presence of a certain proportion of the natural acids of the grape to the sugar present, the most elementary common sense teaches us that when it is ascertained that this proportion is not attained by certain varieties of grapes in certain climates or localities, their culture for wine-making should either be discontinued, or other varieties that supply the deficiency should be planted alongside and blended with the other in the vat. There may be a few who might judge of such matters from the taste alone (if their tasting organs happened to be in good condition at the right time); but such cultivated taste is not at the command of every one, nor is it always infallible even with the best tasters. By the aid of investigations such as are recorded in this report, the general character of the several varieties in these respects can be ascertained, and their adaptations to blends predetermined, with at least a great degree of probability, while scores of others are at once excluded by the simplest of chemical tests. We may not, by the aid of these, be always

able to tell which blends will be successful; but we *can* tell, with perfect certainty, which among two hundred varieties it would be perfectly useless to try for certain blends. The chemist cannot replace the taster or the expert cellarman, but he can save both a vast proportion of useless trouble and expense.

*Viticultural Investigations Require Much Time.*—It need hardly be said that a definite characterization of a grape or of its wine-making qualities cannot be the work of one or two years, even for a single locality. Vintages differ notoriously with the seasons, so that until a sufficiently large number of observations can be brought into the calculation of averages it is impossible to come to valid conclusions. It is largely for this reason that the early publication of this record has not been pressed; it having been observed that the previous publications of results, covering only a year or two, have been taken as indicating established averages, and have led to injudicious investments on the part of too eager producers. In all agricultural experimentation the experience of a number of years taken together, and properly discussed, is absolutely essential to the safety of the conclusions drawn.

It is for these reasons that, notwithstanding the persistent misrepresentations that have from certain quarters been heaped upon the work and those participating in it, it has been steadily pursued, substantially on the original plan, with such modifications as experience suggested, and will so continue so long as the present Director shall have power to uphold it. Being without precedent, for the simple reason that similar questions have never been presented for investigation on so vast a scale, great difficulties have had to be overcome, and are still before us. For instance, it is not possible to tell beforehand at what precise stage of maturity the wine of a particular grape and locality should be bottled for further development; and when, by the passing of the right moment, the wine of one year is spoiled beyond recuperation, it takes at least another year to repeat the experiment. Yet, even then the particular vintage may be of a different character, and again bring to naught the effort to "catch the season" for the particular sample; and when the samples are before the cellar-master by the hundred, it is not easy to "keep the run" of each one.

*Future Operations.*—Since the establishment of experimental culture stations in four representative agricultural regions of the State, it has not been thought advisable to expand further the policy of viticultural stations under private auspices. While extremely welcome and useful, the work thus conducted frequently involves serious inconvenience and expenditure for the patron himself; while on the other hand, at times, the impossibility of securing intelligent labor at the moment required will fatally vitiate the work and results of the Station. So soon, therefore, as it becomes possible to prosecute the same kind of work under the supervision of a competent person throughout the season, as is the case at the regular culture stations established under the Hatch Act, it is manifestly preferable that it should be done. Of course it requires time to bring the vines planted there into bearing, and, in the meantime, the material and data obtained from the private stations or from individuals will continue to be studied and utilized as heretofore. As regards the Cupertino Station, the study of the greater part of the varieties represented there has now been carried through so many years that for those varieties the local questions are probably quite definitely determined, so

far as small-scale tests can do so, and their further prosecution is not called for. A few more years of work will probably place the experimental plot at Mission San José in the same category. The same, however, is not true of the Fresno plot, the distance of which, from the central station, together with other accidental conditions, have rendered the tests thus far made quite insufficient to serve as a basis for definite conclusions for more than a few varieties. As the property upon which the plot is situated has now changed hands, and is thus probably rendered unavailable, it is proposed to purchase carefully selected lots of the more important grapes now under cultivation at different points in the region, for the purpose of experiment, at least until the vines at the San Joaquin Valley Station near Tulare shall be in full bearing. This policy has been pursued for some years past, with the attainment of some important results at the Foothill Station in Amador County; but unfortunately the number of varieties as yet in bearing in that region is so limited, and on the whole so little adapted to the peculiarities of the climate, that we shall have to await the results from the culture plots at the Station to come to any definite conclusions as to the true policy to be pursued in planting wine grapes in the foothills. Nearly the same may be said of the Southern California Station and the region it represents; it is certain that thus far but very few of the high-class varieties best adapted to wine-making in that climate are in bearing there. At the Southern Coast Range Station, no grapes grown in the region will be available much sooner than those grown on the Station ground themselves.

We regret that for a number of years past, few additional data have been obtained from the great wine-making regions of Sonoma and Napa. The depression of the wine industry, which has been most seriously felt in that portion of the State, explains, in a measure, the apparent lack of active interest in the progressive improvement of the product. While, with the more general recognition of the fact that in wines it is quality and not quantity that pays in the end, there has been a very obvious and encouraging improvement in the practice of vinification and its results, there naturally has been little disposition to try experiments of uncertain issue, while little more than the cost of production could be realized by the wine-maker. Nevertheless, a number of encouraging offers of coöperation have been received; among others, from the Italian-Swiss colony of Asti, near Cloverdale, which is the more important as the grape varieties grown there are among the class to which, in our opinion, California will have to look for the production of high-class dry wines in her warmer sections, viz.: the "North Italian type."

*Climatic Conditions.*—The products and meteorological records of California show beyond all possible denial, that over by far the larger portion of the cultivable area, her climate corresponds most nearly to that of the countries immediately bordering upon the Mediterranean. Where the orange and olive grow alongside of the grape, the rational conclusion must be that the character of the latter will be essentially similar to that of corresponding parts of the Old World, and that the experience and practice of Spain and Portugal, Mediterranean France, Italy, Algeria, and Greece, and not that of the Rhine or the Atlantic seaboard of France, is presumably applicable to our wines. Dearly bought experience has amply verified this presumption, with all its practical consequences; and the sooner it is acted upon by our grape-growers and wine-makers

the sooner will the wine industry emerge from the slough of despond into which a concurrence of unfortunate circumstances has kept it for some years past.

*Keeping Qualities and Shipments.*—Among the chief considerations needful to be acted upon is the fact, that in order to reach a market outside of the State, our wines have to undergo prolonged and trying transportation; if by sea, they have to undergo the most critical fourfold change of climate, and under present financial conditions they have to pass this ordeal while still far younger than is usual elsewhere in the shipment of wines to long distances. It is therefore eminently important that the keeping qualities should be among the foremost considerations, and whatever means can be legitimately employed for this purpose should be used with all diligence. It is for this reason that much space is given in this publication to the several processes for the preservation of wine that in climates like ours have become special desideratum, and to some extent the regular practice in the Old World, wherever similar difficulties are experienced. The illogical prejudice against the use of preservative processes which add nothing to the wine and take nothing from it (save, in some cases, what it is the object of all after-treatment of wines to eliminate), but which practically approves of the use of a number of antiseptics and additions foreign to the wines and injurious to its quality, is fast getting to be a thing of the past in Europe, and must soon be so everywhere; the sooner the better.

There are among the grapes now grown in California a number of varieties that are especially sturdy keepers; a similar quality is shown by a number of others not yet grown, but reported upon in our record. Special attention should be given to these, as their wines are, in numerous cases, not only of high quality, but when well made will keep perfectly without any special preservative processes being used upon them prior to shipment.

*Preservative Processes.*—It is freely admitted that thus far none of these processes are without some influence upon special "bouquets," and that it is undesirable to use them on the best class of wines. But as between wines of ordinary consumption, rendered safe by proper pasteurization on the one hand, and those that on the slightest provocation will start in on the way to milk-sourness—the bane of all wines of southern climates—on the other, there can be but one opinion among purchasers and consumers. In this matter, at least, we shall be perfectly safe in following the precedent and example of the countries where most of the wine of the world is produced and consumed.

But as regards sweet fortified wines, there can be no question that the ability of California to produce *all* classes, from the common to the best, is limited only by the probable demand for such wines. Now that the artificial restrictions upon their production are practically removed, and thus competition in the world's market is open, it should be our study to make them of the best quality possible, and to refrain from making this class the Botany Bay of our spoiled dry wines. The best varieties of grapes adapted to their production are mostly already in the State, and the correct process of manufacture (quite different from what has been usually practiced heretofore in California) is no secret. It is also proved that the Great Valley, the Foothills, and Southern California are particularly well adapted to their production, while the coast region, generally speaking, is decidedly less so, while much better adapted to



the making of dry wines. Let each section of the State, then, produce that kind of wine for which it is best fitted by its natural condition, and cease to try to produce "everything everywhere." There can be no permanent advantage in maintaining a chronic fight against natural conditions, so long as there are other producers who are able to get along smoothly and without conflict. The latter will inevitably win in the race.

*Details of the Cellar Work.*—Practically, the plan of work now adopted in the laboratory is as follows: It having been found that the results of experimentation on too small a scale are more or less unsatisfactory, it is desired that the grape lots sent for experimental wine-making should not be less than one hundred pounds; and four times that amount would be preferable, since in larger quantities the influence of accidental outside conditions, and above all that of the cask staves in imparting their flavor to the wine, is proportionately reduced, and the result will be more nearly like that obtainable in large-scale practice. In all cases, however, the grapes are carefully picked over in order to take out all decayed or otherwise unsound berries, as is done in the preparation of all the higher grades of wine in Europe, our object being to produce the best wine that can be made from a given material. The condition and character of the fruit are also recorded, and if there be any doubt of their being correctly named, leaves and canes are sent for in order to identify the variety with certainty. It would be best that such specimens should be sent with all grape lots not coming from vineyards in which the varieties have been determined with certainty.

After picking over, the grapes are weighed, stemmed (the stems being weighed), and crushed (using wooden rollers, not iron). A sample of the must is then taken for immediate analysis, and the grape mash is then (if for red wine) immediately transferred to the fermenting-room, in a tub or tank of suitable size. In our usual practice, the good results of which have now been fully tested, the mash is covered with a "floating top," a cover which is from three fourths to one and one half inches smaller in diameter than the tank at the surface of the mash. This cover, rising and falling with the latter during the fermentation, protects it from excessive access of air; but the influence of the latter is nevertheless given its legitimate scope by a thorough stirring (*foulage*, Fr.) two or three times a day, after removing the cover, while thus at the same time, there is full opportunity given for the extraction of the tannin and color from the skins. Should the must froth over the cover at any time, it is sponged off, in order to give no opportunity for either acetification, molding, or the deposition of the eggs of the vinegar fly. The temperature of the fermenting-room is kept as even as possible by means of a coal or gas stove, and is constantly watched by means of a thermometer, which is read three times daily. The temperature employed has varied somewhat in different years. In 1884 it was kept as near as possible to 65° F. In 1885, in order to conform more nearly to the actual vintage temperature of the State, it was kept at 70°. During the vintage of 1886, the larger portion of the fermentations has been carried through at or near 75°, while experimental ones were made at other temperatures, according to the size of the packages. Experience shows that for quantities not exceeding one hundred pounds, about 75° is probably the best temperature to obtain results similar to large-scale practice; while for those containing double that amount, or more, a

lower outside temperature must be kept, in order to avoid excessive heat within the mash.

During recent vintages a number of experiments have been made with close fermentation, that is, with fermenting tanks completely closed against access of air. While in the Old World the opinion is held by some that this process does not produce wines of as high quality as does open fermentation carefully conducted, yet the many unfavorable influences to which red-wine tanks are exposed in our hot climate, may render close fermentation the more advisable. It involves, of course, more expense in the fermenting tanks and in the handling of the grape mash and pomace; moreover, the color and tannin of the grape are not as completely extracted as when, in the open tank, twice-daily stirring or foulage can easily be done. Another danger is the too great rise of the temperature, which of course takes place more easily in a closed than in an open tank. Nevertheless, the subject deserves the careful attention of those intending to make rather small quantities of high-class wines, in which the additional expense and trouble do not count so much. It is understood that such is the practice in the best "Château" wineries of France.

After fermentation has ceased to be active, the murk or young wine is drawn off latterly, without waiting for the temperature to fall to that of the cellar, as is often prescribed and as was our former practice. If the drawing off is carefully done, so as not to expose the warm wine to the air unnecessarily, no harm can result, and the wine retains a purer flavor than when left on the pomace too long. *The idea entertained by some that color is gained by longer stay of the wine on the pomace, has been conclusively shown to be erroneous by the special work done by us on this subject in 1887* (see "Report on Methods of Fermentation," 1888). Tannin alone is gained, to some extent, by the longer maceration; and the wine-maker must, in a measure, be governed in his practice by his requirements in this respect.

In our experimental work the pomace is always pressed and the press wine added to the main body, our object being to ascertain the amount of color and tannin readily obtained for the wine; it being understood that the separation of the first run from the press wine, while mostly improving the wine as regards smoothness and bouquet, is apt to leave it deficient in the tannin and color.

The murk or young wine is tested, at least with respect to acid and color, immediately after pressing; but the determination of tannin and alcohol is deferred until the wine has undergone the first part of its after-fermentation, and clear samples can be taken from the casks. For the after-fermentation, the packages are placed in a cellar of which the temperature rarely varies more than a small fraction of a degree from 60° when left to itself, but which, by the aid of a small gas flame, is readily kept at about 64°, the proper temperature for the after-fermentation.

The red wines are racked from the lees about the middle of December, at farthest, and as a rule, every two or sometimes three months thereafter. In this operation we usually give the wine a full aeration, by either using a rose spout or by letting it fall from some height into the receiving vessel. The effect of this frequent racking and aeration is seen in the rapid maturing and clearing of the wines, which are never fined save as an experiment to students and visitors.

The treatment of white wines corresponds to that of the red, the pressing being, of course, done either immediately or, experimentally, a certain number of hours after crushing.

The treatment of the diseases of the wines is done essentially by pasteurization, which, carefully made, after the second fermentation is over, has shown to be in most cases satisfactory. However, several exceptions must be reported in the case of wines attacked by tartaric (filiform) and lactic fermentation, on which pasteurization had no effect.

The use of antiseptics of any nature, which are injurious to wine and to the health of consumers, do not enter into our practice, although they may form the subject of experimental investigations.

The wines should of course be tasted at each racking, but want of time frequently prevents this desirable controlling experiment being made in all cases. Persons who have sent grapes are invited to come and make this test of their wines personally; and generally the laboratory is open for this purpose to persons professionally interested in the matter, under the personal guidance of the professor or chief assistant, and not otherwise.

#### COLORIMETRIC MEASUREMENT OF WINES.

In France, the country preëminently of red wines, the art of color-blending has developed hand in hand with that of producing definite qualities of wines, such as are demanded by customers year after year, from the annually varying product of the vineyards. There the experienced purchaser of wines for blending purposes, scrutinizes carefully not only the depth, but also the particular tone of the wine color, in order to obtain from their intermixture just such products as his customers are accustomed to. There are certain commercial designations both of tint and depth of color, but they are intelligible only to the expert, and vary from place to place, so that a unification of nomenclature was obviously necessary so soon as the greater facilities for communication brought these variable designations into contact with each other.

For some time nothing more definite than measurements of intensity were thought of, and these were usually made by the simple process of measuring how much water could be added to a deep-tinted wine before the tint became similar to that of a certain light-colored standard wine, or, preferably, some other solution. For, since wines lose color, more or less, with advancing age, no permanent standard could be maintained by using any one wine as a typical tint. For some time the use of the deeply-colored solution of potash permanganate was used; subsequently that of a solution of rosaniline of .2108 gramme per litre was employed for comparison by the French. The Germans found this fluid too deeply colored for their use, and adopted one tenth of that strength as the standard. The instrument with which the measurements were made consisted simply of a dark box, in the far end of which were two parallel-walled glass cells of exactly equal diameter. One of these was filled with the standard solution; the other served for the wine to be tested, to which water was gradually added until the operator judged the two liquids, held toward the light, to be of equal intensity.

This method involved, however, an insuperable source of error in the varying tints of wines, it being impossible to judge definitely of *intensity* apart from the *tone* of two different colors, in which case no two observers would agree as to the exact point in question. It was therefore

prescribed to add to the wines, before making the comparisons, enough of sulphuric acid to render them a nearly uniform (red) tone of color, after which the measurement was made as usual. In this way the relative intensity could be determined with tolerable accuracy, but all distinction as to the natural tone of color was done away with; and yet this forms quite as important a feature in the character of wines as the intensity, and in fact is less variable.

The indefiniteness in the nomenclature of colors had long ago been recognized as a serious difficulty in certain manufactures, and notably in that of the Gobelin tapestries, which form the especial ornament of the royal palaces of France.

This difficulty led to the adoption by French manufacturers of the color-scale devised by Chevreul, the distinguished French chemist, for the Gobelins established at Paris. In this elaborate scale the variations of each named color are designated by intercombinations of their several names for the general tints, while the minor variations are marked by numbers. Thus we have first, second, third, etc.; red, purple-red, and purple-red Nos. 1, 2, 3, etc. Each of these tints is identified by the aid of standard colored silks, dyed with the most permanent dyes known, which are carefully preserved at the Gobelins factory and at other points, from which the dyeing establishments can verify their tints and standards. This collection is just like one of standard weights and measures; and even should the standards be destroyed their identity is preserved in the formulas for their production, which were elaborately verified at the time of the adoption of Chevreul's scale. For the reds and purples, the cochineal serves as the basis of the firmest and most permanent colors, and these are alone used in the color-scale for wines.

In the latest improved instrument for this purpose (Salleron's vinocolorimeter), this color-scale is represented by ten little silk disks about three quarters of an inch in diameter, placed in a row on a pasteboard strip. Alongside of these runs a row of similar disks of white silk, and the comparison is made by viewing these white silk surfaces through a layer of the wine to be examined, which, in making the observation, is made to appear exactly equal to some one of the colored silk disks, by means of a screw arrangement, which permits of making the layer of wine placed between the eye and the white silk disks, of any thickness not above three fifths of an inch. This is effected by means of two glass-bottomed cylindrical vessels, of which the outer one serves to contain the wine, while the inner one can be screwed up and down so as to place its glass bottom at any desired distance from that of the outer vessel, within the mass of wine. This distance, which of course represents the thickness of the layer of wine to be viewed, can be easily measured by the aid of scale divisions, marked both upon the inner and outer cylinder, and which permit the reading off of hundredths of millimetres, and of thousandths if desired. The compound cylinder containing the wine is mounted on a small stand like that of a stereoscope, the colored silk disks being seen through one of two tubes, while the other is the vessel with the wine. The color-scale card is slid under the eye-pieces and the wine layer so adjusted (by revolving the inner cylinder) as to be of nearly the same intensity as the type disks. Then we seek the one which corresponds most nearly to the tone of color of the wine, and by alternately adjusting for intensity and for tone, we soon come to the disk which most nearly agrees in all respects with the layer of wine. Then,

recording the name of the tint and the thickness as measured by the scale on the cylinders, we have all the data needed for a permanent record of the exact color of the wine, the intensity of which is, of course, inversely proportionate to the thickness of the wine layer that has furnished the comparison.

In order to adapt these measurements to the current habit of using a decimal scale, most easily understood by all, such a scale may be formed by dividing the number of millimetres read off in the observation, into one and the same constant number, which represents one hundred times the lowest reading obtained, and which, of course, corresponds to the most intensely colored wine. Thus, the latter will be marked 100, as the highest on the intensity scale, while all others will fall below, and their intensity will be expressed by whole numbers or mixed fractions below 100, *i. e.*, percentages referred to the deepest-tinted wine.

*Diagram of Wine Colorimeter Scale referred to in the text.*

| <i>Tint.</i>       | <i>Shade.</i>   |
|--------------------|-----------------|
| Violet-red (v. r.) | Violet-red.     |
|                    | 1st—Violet-red. |
|                    | 2d—Violet-red.  |
|                    | 3d—Violet-red.  |
|                    | 4th—Violet-red. |
|                    | 5th—Violet-red. |
| Red (r.)           | Red.            |
|                    | 1st—Red.        |
|                    | 2d—Red.         |
|                    | 3d—Red.         |
| Orange-red.        |                 |

The letter *y* used sometimes in the tables in the expression of color, denotes that in order to reach the typical tint one (or two, as the case may be) disk of yellow glass had to be used on the type-color disk.



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## PART II.

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### RECORD OF WORK IN THE VITICULTURAL LABORATORY FOR THE SEASON 1887-89.

By L. PAPARELLI.

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VITICULTURAL STATIONS (under private auspices) that have supplied material for the work here reported:

**West Side Santa Clara Valley Station;** Cupertino, Santa Clara County. JOHN T. DOYLE, Patron; Menlo Park.

**East Side Santa Clara Valley Station;** Mission San José, Alameda County. JOHN GALLEGOS, Patron; Mission San José.

**Fresno Station;** Fresno City, Fresno County. E. B. ROGERS, Patron; Fresno.

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## DESCRIPTIVE LIST OF GRAPES RECEIVED AND WINES MADE, WITH ANALYSES OF MUSTS AND WINES.

NOTE.—The classification of grapes and wines here given is made for convenience of reference, in accordance with the most usual or most prominent characters; but of course is not absolute, since one and the same grape may, according to climate, location, and treatment, be made to yield a great variety of wines.

### 1. BORDEAUX, OR CLARET TYPE.

It might seem unnecessary to give here a short account of the wines of this type, as we have done for others, for the reason that such wines, of universal reputation, are well known in this State, and that the grapes of the Gironde region were among the first varieties brought in the earliest importations to this State. But their acclimation and the peculiarities they have shown in California (the wines thus far produced in this State being only fair representatives of what the grapes yield in their native country) explain the necessity of a few remarks on this important type.

The wines of this type, more than those of any other, are obtained under special conditions of soil and climate, which are very difficult to realize in other countries. This, together with the care in the minutiae of the manipulations of the wine, produce the peculiarities that characterize the genuine type.

Grape-growers of California, as well as those of other similar countries, should know that it is not simply by planting the grapes of the Bordelais region, and by following its method of vinification, that the same products may be obtained; efforts in that precise direction are apt to produce failure rather than success. The adaptation of the grape varieties to the soil and climate is the most important thing to be taken into consideration; doubtless they will grow well in other regions, but it is necessary before planting large and expensive vineyards with these varieties, to make small culture-experiments, in order to ascertain their local adaptation. Most of the work of our Station has been done in this direction, not only for the Bordeaux varieties, but for all others imported in California; and by the observation of the peculiarities that each grape has shown in the different districts of the State, many mistakes in the planting of vineyards have been avoided by new settlers that have asked advice of this Station.

The vine-growers of the Bordelais say that their grape varieties want one hundred and eight days of heat from the blooming to the vintage time, at the average temperature of 67° F. It is therefore important to know if this temperature is that of the locality where it is intended to establish a vineyard of Cabernets, Malbeck, or Merlot, for in case it is higher it would produce rough wines without bouquet, and if lower, it would produce "green" wines. Moreover, the care in culture, such as pruning, cultivation, etc., and the methods of vinification, should be adapted as much as possible to special local conditions, and should not be based on the Bordeaux practice, which is not likely to yield the same

results here that it does there; but from it we should learn to give the greatest care to the manipulation of the wines, for, if the soil and climatic conditions play a large part in the reputation of this class of wines, the scrupulous care given has no less importance.

The first class of the wines of this type, those of the *Médoc*, are characterized by a bright color, by great mellowness, and an agreeable fruity taste. These qualities are rendered more pronounced by their very rich "sève," their special and delicate aroma and bouquet, and by the fact that they can stand dilution well. The latter quality makes this type to differ essentially from the *Burgundy* type, which being (contrary to the *Bordeaux*) characterized by little color, tannin, and acid, the slightest dilution renders the wine unpalatable.

Besides this, their hygienic properties, on account of the iron they contain under the form of tartrate and phosphate, have formed the great reputation of these wines, and consequently they have acquired a high value in the markets of the world.

These wines are made principally with the *Cabernets*, *Malbeck*, and *Merlot*, while the lower grades are made with the *Verdot*, the *St. Macaire*, and the *Gros Mansenc*. The other grape varieties that we have included in this type, while not strictly belonging to it, have some qualities that in vinification, either alone or in blending, may sometimes yield a medium class of wines, resembling those of the *Bordelais*. A good account of the special qualities for each one of these varieties, both in its native country and in California, is given in the following pages.

#### MALBECK, OR CÔT.

The general character and uses of the *Malbeck* are sufficiently well understood in California to render any elaborate recapitulation unnecessary. It is one of the most widely cultivated grape varieties of France, where it forms, more especially, the basis of a large proportion of the wines of the *Bordeaux* type. Its best qualities seem to be developed in the western departments, within reach of the tempering influence of the Atlantic Ocean.

That notwithstanding its importance as a characteristic ingredient of the *Bordeaux-claret* type of wines, the *Malbeck* has not been more widely cultivated in California, is doubtless due to the light bearing that it has shown almost everywhere, even under the appropriate long-pruning, and still more under the short-pruning, which it has in many cases received. It is noteworthy that while sometimes producing well the first two or three years after it comes into bearing, it seems afterward to become subject to coulure, or failure to set fruit, to a grievous extent, varying greatly in different localities and seasons, and rendering it a very precarious variety for the chief crop. But the abundance of tannin, color, and body, as well as the characteristic "*Bordeaux*" flavor that it supplies to wines, render it a very desirable material for special blends, for which it is not easy to find a substitute.

As a widely cultivated variety, the *Malbeck* naturally has its "sports," differing in some particulars from the prevailing type, and known by local names, generally framed with the word *Côt*, connected with that of the locality. These usually differ more in the matter of bearing than in wine-making qualities, having perhaps been derived as cuttings from some particularly strong bearing stock. In other respects—in regard

to color, body, and tannin, for which the Malbeck is especially prized—no material difference exists in these sports.

A number of separate importations of the Malbeck have been made in California at different periods, and hence the variety is found with varying leaves, length of joint, and especially with bunches differing from the European types grown in poorer soils, by greater compactness, and a tendency to a cylindrically elongated termination, whereby the bunch receives quite a different general aspect. The same tendency is, however, to be noted in other varieties, notably the Cabernets, and many others. It is probably simply the result of youthful vines growing in virgin soils.

The study of sub-varieties, and of localities in which this grape bears regularly, is a matter of great concern for the production of the genuine claret type in this State. It should receive special attention in the vineyards of the Santa Cruz Mountains, the more as its relatively earlier maturity, as compared with France, will render it desirable on that score at the higher elevations.

TABLE OF PRODUCTION.

| MALBECK.                                                               | Number of Vines. | Total Weight of Grapes, in lbs. | Average per Vine, in lbs. | Date of Picking. |
|------------------------------------------------------------------------|------------------|---------------------------------|---------------------------|------------------|
| 1887—No. 700. J. T. Doyle, Experimental Plot, Cupertino                | 20               | 25                              | 1.3                       | Oct. 5           |
| 1888—No. 850 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino | 19               | 13                              | .7                        | Sept. 17         |
| No. 856 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino       | 30               | 87                              | 4.4                       | Sept. 17         |
| 1889—No. 1080. J. T. Doyle, Cupertino                                  | 20               | 75                              | 3.7                       | Sept. 14         |

## ANALYSES OF WINES.

| MALBECK.       | Date of Picking.....                             | MUST.                          |                        |                        |           | WINE.           |                |             |                   |                              |                                 |            |           |
|----------------|--------------------------------------------------|--------------------------------|------------------------|------------------------|-----------|-----------------|----------------|-------------|-------------------|------------------------------|---------------------------------|------------|-----------|
|                |                                                  | Solid Contents by Spindle..... | Sugar by Copper Test.. | Acid as Tartaric ..... | Ash ..... | Alcohol.        |                | Tannin..... | Acid as Tartaric. |                              | Volatile Acid (as Acetic) ..... | Body ..... | Ash ..... |
|                |                                                  |                                |                        |                        |           | By Weight ..... | By Volume..... |             | At Pressing ..... | Wine at Six to Eight Months. |                                 |            |           |
|                |                                                  |                                |                        |                        |           |                 |                |             |                   |                              |                                 |            |           |
| 1882—No. 149.  | H. W. Crabb, Oakville*                           |                                |                        |                        |           | 10.81           | 13.27          | .088        |                   | 38                           |                                 | 2.18       | 26        |
| 1883—No. 150.  | J. T. Doyle, Cupertino*                          |                                |                        |                        |           | 11.15           | 13.63          | .240        |                   | 35                           |                                 | 3.59       | 36        |
| 1884—No. 211.  | Natoma Company, Natoma                           | Sept. 4                        | 20.94                  | 21.33                  | .61       | 8.34            | 10.42          | 1.00        | .42               | 45                           |                                 | 2.68       | 36        |
| No. 151.       | Le Franc, New Almaden Vineyard*                  |                                |                        |                        |           | 9.99            | 12.45          | 1.72        |                   | 46                           |                                 | 3.62       | 45        |
| No. 142.       | J. B. J. Portal, Burgundy Vineyard, "Ploussard"* | Sept. 7                        |                        |                        | .65       | 10.69           | 13.12          | .091        |                   | 54                           |                                 | 2.77       | 27        |
| 1885—No. 336.  | H. Keatinge, Lower Lake.                         |                                |                        |                        |           |                 |                |             |                   |                              |                                 |            |           |
| No. 445.       | J. T. Doyle, Cupertino*                          |                                |                        |                        |           | 10.81           | 13.27          | .172        |                   | 56                           |                                 | 3.60       | 46        |
| No. 438.       | J. B. J. Portal, West San José, "Ploussard"*     |                                |                        |                        | .60       | 11.39           | 13.91          | 1.80        | .62               | 47                           |                                 | 2.70       | 36        |
| 1886—No. 475.  | J. T. Doyle, Experimental Plot, Cupertino        | Sept. 14                       | 20.60                  |                        |           | 18.27           | 10.36          | .132        |                   |                              |                                 | 2.22       |           |
| No. 619.       | C. C. McIver, Mission San José*                  |                                |                        |                        |           | 10.91           | 13.36          | .214        |                   | .65                          |                                 | 2.80       | 23        |
| No. 635.       | J. P. Smith, Livermore*                          |                                |                        |                        |           | 7.78            | 9.73           | .263        |                   | .53                          | .09                             | 3.30       | .43       |
| 1887—No. 700.  | J. T. Doyle, Experimental Plot, Cupertino        | Oct. 5                         | 25.26                  | 25.88                  | .45       | 9.27            | 11.55          | .344        | .49               | .61                          |                                 | 3.10       |           |
| No. 709.       | J. T. Doyle, Experimental Plot, Cupertino        | Oct. 8                         |                        | 29.83                  | .43       | 11.62           | 14.20          | .484        | .60               | .42                          |                                 | 3.00       |           |
| 1888—No. 850.  | J. T. Doyle, Experimental Plot, Cupertino        | Sept. 17                       | 22.74                  | 23.91                  | .42       | 8.84            | 11.00          | .244        | .45               | .52                          |                                 | 2.60       |           |
| No. 886.       | E. W. Hilgard, Expt'l Plot, Mission San José     | Oct. 6                         | 23.82                  | 24.64                  | .39       | 8.84            | 11.00          | .273        | .50               | .41                          |                                 | 3.45       |           |
| 1889—No. 1114. | J. Gallegos, Mission San José                    | Sept. 29                       | 25.20                  | 25.19                  | .34       | 10.07           | 12.54          | .330        | .48               | .35                          |                                 | 3.15       |           |
| 1890—No. 1303. | J. Gallegos, Mission San José                    | Oct. 5                         | 24.55                  |                        | .56       |                 |                |             |                   |                              |                                 |            |           |
| No. 1321.      | J. T. Doyle, Cupertino                           | Oct. 11                        | 25.20                  |                        | .53       |                 |                |             |                   |                              |                                 |            |           |

\* Wines sent for examination. † December, 1886. ‡ June, 1887.

## COLOR READINGS.

| MALBECK.                           | 1886.                                            |                                       |                            | 1887.                       |                                | 1888.                                             |                                             | 1889.                              |
|------------------------------------|--------------------------------------------------|---------------------------------------|----------------------------|-----------------------------|--------------------------------|---------------------------------------------------|---------------------------------------------|------------------------------------|
|                                    | J. T. Doyle,<br>Experimental<br>Plot, Cupertino. | C. C. McIver,<br>Mission San<br>José. | J. P. Smith,<br>Livermore. | John T. Doyle, Cupertino.   |                                |                                                   | John Gallegos, Mission San José.            |                                    |
|                                    | No. 475.                                         | No. 619.*                             | No. 635.*                  | No. 700.                    | No. 709.                       | No. 850.                                          | No. 886.                                    | No. 1114.                          |
|                                    | Light garnet.<br>September 25                    | September.                            | September.                 | October 15<br>66.6<br>V. R. | October 17<br>100.0<br>1 V. R. | Light carmine.<br>September 24<br>57.1<br>1 V. R. | Light red.<br>October 12<br>72.7<br>1 V. R. | October 7<br>85.1<br>1 V. R.-V. R. |
| Must {<br>At pressing {<br>Color { |                                                  |                                       |                            |                             |                                |                                                   |                                             |                                    |
| One month                          | 38.0                                             | 2 V. R.                               |                            | 44.4                        | V. R.                          | 40.8                                              | 1-2 V. R.                                   | 52.6                               |
| Two months                         |                                                  |                                       |                            |                             |                                | 45.4                                              | 2 V. R.                                     | 23.5                               |
| Three months                       |                                                  |                                       |                            |                             |                                |                                                   | 43.9                                        | 4 V. R.                            |
| Four months                        |                                                  |                                       |                            |                             |                                |                                                   | 29.6                                        | 4 V. R.                            |
| Five months                        | 27.6                                             | 2 V. R.                               | 36.0                       | 3 V. R.                     | 66.6                           | 1 V. R.                                           | 30.7                                        | 4 V. R.                            |
| Six months                         |                                                  |                                       |                            |                             |                                | 40.0                                              | 1-2 V. R.                                   | 20.3                               |
| Seven months                       | 27.0                                             | 1 V. R.                               | 40.6                       | 5 V. R.                     | 56.3                           | 1 V. R.                                           |                                             |                                    |
| Eight months                       | 24.0                                             | 2-3 V. R.                             |                            |                             |                                |                                                   |                                             |                                    |

\* Wines sent for examination.

**No. 700. Malbeck.** From J. T. Doyle, University Plot, Cupertino. The grapes arrived October 6, 1887, and were crushed the next day. Their condition was not very good, about half being partly dried; bunches small, sparse, badly coulored, and will not make a representative wine. The juice showed 25.26 per cent of solid contents. Fermentation of 24 pounds crushed reached its maximum of 89° on October 10th. It was drawn off on October 15th, eight days from crushing. The yield of the above amount was 1½ gallons, or at the rate of 146 gallons per ton.

**RECORD OF RACKING, TASTING, ETC.—1887. December 20.** A microscopical examination of the sediment shows lactic germs in abundance, and some acetic ferments with effete yeast in considerable amount. Racked and pasteurized the wine.

**1888. February 16.** (Sample in glass.) Condition bright, with undeveloped bouquet, very heavy body, medium acid, and high astringency.

**June 4.** Condition bright, with advanced and characteristic bouquet, considering that the wine was kept in glass. As a whole the wine is a little flat, with an unpleasant lactic after-taste.

The microscope still shows the sediment to contain considerable lactic and some acetic germs. The wine was again racked.

**No. 709. Malbeck.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 11, 1887, and were crushed the same day. They were in fair condition, a great deal of coulure, some dried berries, but will make a pretty fair test of wine. The juice showed 27.54 per cent of solid contents. Fermentation of 115.75 pounds crushed reached its maximum of 83° on October 14th, seventy-two hours from setting, fermenting very actively during this time. The rack was drawn off six days from crushing, the yield from the above amount being 8.635 gallons, or at the rate of 149 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 16.** A clean-tasted, very characteristic wine of very high astringency.

**1888. February 2.** Wine racked from the lees.

**February 8.** Condition bright, heavy body, pleasant acidity, unpleasantly high astringency; the wine requires blending, and is a splendid material for that purpose.

**June 20.** Condition bright, deep purple color, advanced and pleasant bouquet, very high astringency, low acid, alcoholic strength too high. The sediment shows, under the microscope, low ferment and traces of lactic germs; racked and pasteurized the wine for safety.

**1889. November.** Condition bright, very dark color, faint but agreeable bouquet, clean and well-developed taste, full body, medium acid, high tannin, good quality; stands 50 per cent dilution well, when the acid becomes too weak for the astringency.

**No. 850. Malbeck** (pruned short). From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived September 18, 1888, in good condition, and were worked the same day. Vines short-pruned and an extremely light first crop, some second crop, and enormous wood-growth; excessive coulure, from 70 to 80 per cent, sometimes more, in full bloom. Stems green, berries very sweet and well developed. The juice showed 22.74 per cent of solid contents. Fermentation of 99 pounds crushed reached its maximum of 85° on September 21st. The murk was drawn off on September 24th, five days from crushing. The yield from the above amount was 8½ gallons, corresponding to 166.3 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. October 25.** Racked; condition clear and action stopped; placed in the cellar.

**1889. January 10.** Wine clear, not bright; well-developed bouquet, mild and pleasant acid, medium body and alcohol, good astringency. In the after-taste there is a slight suspicion of lactic acid.

**January 12.** "Grapes were too ripe." (E. W. H. and F. P.)

**March 28.** Lees show lactic germs; pasteurized.

**May 14.** Racked; condition clear.

*August 3.* Condition bright, very good color, undeveloped bouquet, flavor, covered by acid, no after-taste, a light body, full acid, good astringency, medium alcoholic strength, quality passable, acid is sufficient, but body too light for dilution.

*1890. February 6.* Lees sound.

*February 18.* Condition bright, improved in bouquet, full acid but not unpleasant, general quality much improved and developed.

*February 26.* Racked.

*No. 886. Malbeck.* From E. W. Hilgard, Mission San José. From imported cuttings, 1884. Grapes arrived in good condition on October 9, 1888, and were crushed the same day. They were fully ripe, but showed quite 50 per cent coulure on bunches and vines, probably 75 per cent from sunburn in full bloom. Stems dry, or nearly so. The juice showed 25.82 per cent solid contents. Fermentation of 54.5 pounds reached its maximum of 92.5° on October 11th. On October 13th the murk was drawn off, four days from crushing, yielding 4½ gallons, corresponding to 160.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *October 29.* Racked; wine sound.

*November 28.* Taken to cellar.

*December 11.* Racked; lees show no unsound germs, but the wine was pasteurized for safety, the quantity being so small; wine is clear, almost bright, with well-developed bouquet, vinous and characteristic flavor, well-proportioned acid and tannin; quality high.

*1889. January 12.* "Better than No. 850; a very good wine." (E. W. H. and F. P.)

*February 28.* Racked; dead lactic germs abundant in lees.

*August 3.* Condition bright, slight bouquet, and rather pleasant flavor; tastes faintly lactic; acid normal; full astringency and alcohol; quality medium; wine stands 50 per cent dilution.

*1890. February 8.* Lees contain an abundance of bitter and lactic germs; wine poor.

*February 13.* Wine much deteriorated since last tasting; lactic acid prominent.

*March 7.* Racked.

*No. 1114. Malbeck.* From J. Gallegos, Experimental Plot, Mission San José. Arrived October 1, 1889, in fair condition and completely mature, and was worked the following day. Juice showed 25.20 per cent of solid contents. Fermentation of 80 pounds crushed commenced October 3d, and reached its maximum of 88.5° on October 4th. The murk was drawn off October 7th, four and one half days from crushing. The yield from the above amount was 5.63 gallons, corresponding to 140.6 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 25.* Not quite clear, very deep color, not pleasing bouquet, neutral flavor, rather flat taste, medium body and acid, full tannin; quality too young to judge.

*November 27.* Racked and taken to the cellar.

*1890. January 20.* Condition bright, bouquet improved, rather prominent but agreeable acid, general quality toned down since last tasting. Sediment shows a small amount of lactic ferment.

*May 6.* Condition clear; taste mature, but shows slight lactic taint; pasteurized.

### *Discussion of Results.*

The table of analyses shows that aside from the cases of very young (Nos. 211, 142, 149, 336, 475, 635, and in the case of No. 850), short-pruned vines, the general character of the Malbeck, as reported from the Old World, is well defined. The high sugar (and therefore high alcohol) contents easily acquired by the berries, the heavy body of the wines (mostly well above 3 per cent), the high tannin and low acid when the vines were old and the fruit well matured, as well as the deep color, well maintained in keeping, are all points mentioned of the Malbeck in France. But it is also mentioned there as a sturdy keeper, while,

as the record shows, we have found great difficulty in maturing the wines without their acquiring the lactic taint. This has doubtless been due to the fact that almost all the samples worked by us were badly coulered, and as this is a very common failing of the variety, it must be regarded as a point against it, since bunches much affected by coulure are almost sure to contain more or less of unsound, half-ripe, and half-dried berries, which infect the wine unless picked out before crushing. It is questionable whether, laboring under such disabilities, even the undoubted virtues of the Malbeck can commend it to any more than exceptional culture in localities and exposures that render it more or less secure from its cardinal enemy—sunburn. As a rule it will be better to seek for other blends to serve for the modification of the too pronounced characters of the Carbernets, which with us prove more reliable and abundant bearers than the Malbeck. The Beclan, Refosco, Gros Mansenc, Tannat, and some others seem well adapted to fill its place, according to the result it may be desired to accomplish, or to suit the particular market to be supplied.

#### CABERNET FRANC.

The Cabernet Franc occupies a prominent place as one of the standard wine grapes of the Bordeaux region. It is a vigorous and hearty vine, which, wherever it is grown in a suitable soil, yields wines of high and delicate bouquet and of excellent keeping qualities. This characteristic bouquet is due to a peculiar flavor of the grape, which is maintained under the most diverse conditions of growth; while the grape-stems, highly charged with tannin, yield abundance of the latter substance, so as sometimes to render it desirable to exclude them from the vat. The berries resist rains and moisture remarkably well, so that they can be fully matured without fear of injury. Such full maturity, necessary for the production of the "great wines," can only be attained in climates at least as warm as that of Bordeaux, it being a grape of the second epoch of ripening.

The Cabernet Franc succeeds especially in dry and stony soils, in which varieties of less vigorous habits could not prosper. In deep and rich soils it runs to wood, and its berries lose largely their quality. It must always be pruned long, being a shy bearer at best, although somewhat more prolific than the Cabernet Sauvignon.

In general aspect and texture of leaf the Cabernet Franc greatly resembles the Sauvignon, but the leaves of the latter are not only more deeply cut, but the overlapping lobes make them appear as though perforated with a punch, making diamond-shaped holes, while in the Cabernet Franc the lobes lap only slightly or not at all. Both have a peculiarly lustrous leaf, the blade of which is even, rather than thin and paper-like, and ordinarily below medium size. In this respect both differ so strikingly from the Malbeck that there can be no excuse for confounding the latter with either. At Menlo Park, as well as at Cupertino, grafts of Cabernet Franc on vigorous Charbono and Zinfandel stocks have borne remarkably well, even the first year from the graft, and quite fully the second year. Thus, as in bearing qualities, it is decidedly ahead of the Cabernet Sauvignon, and as its wine matures quicker and will generally be esteemed of such high quality and striking character that few will miss the fine traits of the Cabernet Sauvignon, those desiring to produce



a fine quality of Bordeaux wines should, on the whole, regard the Cabernet Franc with special favor.

In the experimental plot at Cupertino it stands credited, in 1886, with 21.2 pounds as the average of twenty vines (long-pruned), making a better record by one pound than the Black Burgundy, in the same place, and nearly doubling the product of the Malbeck. In succeeding years, however, its product has been much less, owing mainly to coulure from sunburn, which appears to affect this variety rather more than the Cabernet Sauvignon. At least such has been the experience at Mission San José, where, in the course of three years' bearing of grafts on Riparia, the abundant promise of the bloom has been realized only on individual vines, while the general average product has been rather unsatisfactory.

TABLE OF PRODUCTION.

| CABERNET FRANC.                                            | Number of Vines.. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs..... | Date of Picking... |
|------------------------------------------------------------|-------------------|---------------------------------------|----------------------------------|--------------------|
| 1887—No. 716. J. T. Doyle, Experiment'l Plot, Cupertino..  | 20                | 40                                    | 2                                | Oct. 11            |
| 1888—No. 876. J. T. Doyle, Experiment'l Plot, Cupertino..  | 9                 | 37                                    | 4.1                              | Oct. 1             |
| 1889—No. 1107. J. T. Doyle, Experiment'l Plot, Cupertino.. | 19                | 90                                    | 4.8                              | Sept. 25           |

## ANALYSES OF WINES.

| CABERNET FRANC.                                                        | Date of Picking | MUST.                     |                        |                  |     | WINE.    |        |                         |                         |               |       |     |           |
|------------------------------------------------------------------------|-----------------|---------------------------|------------------------|------------------|-----|----------|--------|-------------------------|-------------------------|---------------|-------|-----|-----------|
|                                                                        |                 | Solid Contents by Spindle | Sugar by Copper Test.. | Acid as Tartaric | Ash | Alcohol. | Tannin | Total Acid as Tartaric. |                         | Volatile Acid | Body  | Ash |           |
|                                                                        |                 |                           |                        |                  |     |          |        | At Pressing             | At Six to Eight Months. |               |       |     |           |
|                                                                        |                 |                           |                        |                  |     |          |        |                         |                         |               |       |     | By Weight |
| 1884—No. 141. J. B. J. Portal, Burgundy Vineyard*                      | Sept. 17        | 20.60                     | 19.88                  | .62              | .28 | 9.78     | 12.18  | .110                    | .48                     |               | 3.02  | .27 |           |
| No. 212. Natoma Company, Natoma                                        | Oct. 18         | 22.43                     | 21.38                  | .77              | .30 | 9.63     | 12.00  | .035                    | .38                     |               | 2.84  | .43 |           |
| No. 213. Wm. Pfeiffer, Gubserville                                     |                 |                           |                        |                  |     | 8.48     | 10.58  | .070                    | .63                     |               | 2.13  | .29 |           |
| 1885—No. 436. J. B. J. Portal, Burgundy Vineyard*                      |                 |                           |                        |                  |     | 10.35    | 12.82  | .174                    | .61                     | .14           | 2.70  | .31 |           |
| No. 378. L. D. Combe, San José*                                        |                 |                           |                        |                  |     | 9.63     | 12.00  | .126                    | .88                     |               | 3.39  | .40 |           |
| No. 435. J. B. J. Portal, Burgundy Vineyard*                           |                 |                           |                        |                  |     | 10.54    | 13.00  | .136                    | .63                     |               | 2.90  | .32 |           |
| No. 459. L. D. Combe, San José*                                        |                 |                           |                        |                  |     | 9.85     | 12.27  | .124                    | .62                     | .29           | 2.60  | .32 |           |
| 1886—No. 552. J. T. Doyle, Experimental Plot, Cupertino.               | Oct. 23         | 24.80                     | 24.64                  | .35              | .34 | 9.78     | 12.18  | .264                    | .45                     |               | 2.82  |     |           |
| No. 616. C. C. McIver, Mission San José*                               |                 |                           |                        |                  |     | \$9.63   | 12.00  | .232                    | .57                     |               | 3.40  | .33 |           |
| No. 593. J. T. Doyle, Cupertino*                                       |                 |                           |                        |                  |     | 8.84     | 11.00  | .176                    | .51                     |               | +2.85 | .35 |           |
| 1887—No. 716. J. T. Doyle, Cupertino.                                  | Oct. 11         | 24.85                     | 24.64                  | .56              | .39 | 10.07    | 12.54  | .204                    | .56                     |               | 2.90  |     |           |
| 1888—No. 876 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino. | Oct. 1          | 23.34                     | 24.02                  | .35              | .35 |          |        |                         |                         |               |       |     |           |
| No. 877 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino.     | Oct. 1          | 22.92                     | 23.62                  | .27              | .38 | 9.27     | 11.55  | .229                    | .56                     |               | 3.05  |     |           |
| No. 887. J. Gallegos, Experimental Plot, Mission San José.             | Oct. 6          | 23.92                     | 22.67                  | .27              | .35 | 8.48     | 10.58  | .199                    | .49                     |               | 2.80  |     |           |
| 1889—No. 1107. J. T. Doyle, Cupertino.                                 | Sept. 25        | 26.10                     | 26.24                  | .45              | .34 | 10.63    | 13.09  | .108                    | .41                     |               | 3.60  |     |           |
| 1890—No. 1336. J. T. Doyle, Cupertino.                                 | Oct. 11         | 22.60                     |                        | .82              |     |          |        |                         |                         |               |       |     |           |

\* Wines sent for examination. † Sugar, .45 per cent. ‡ December, 1886. § June, 1887.

## COLOR READINGS.

|                 |  | 1886.                                            |                                       | 1887.                     | 1888.    |                                                            | 1889.                                                  |
|-----------------|--|--------------------------------------------------|---------------------------------------|---------------------------|----------|------------------------------------------------------------|--------------------------------------------------------|
| CABERNET FRANC. |  | J. T. Doyle,<br>Experimental<br>Plot, Cupertino. | C. C. McIver,<br>Mission San<br>José. | John T. Doyle, Cupertino. |          | J. Gallegos,<br>Experimental<br>Plot, Mission<br>San José. | J. T. Doyle,<br>Experimental<br>Plot, Cupert-<br>tino. |
|                 |  | No. 552.                                         | No. 616.*                             | No. 593.*                 | No. 716. | No. 876.                                                   | No. 887.                                               |
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\* Wines sent for examination.

*No. 716. Cabernet Franc.* From J. T. Doyle, Cupertino. The grapes arrived October 12, 1887, and were crushed the same day. Their condition was good; berries sound and large for the variety, a little more than Cabernet Sauvignon. Coulure about the same, *i. e.*, 50 per cent; very sweet, some berries dried in part. "Wild" taste decidedly less pronounced than in the Cabernet Sauvignon. The juice showed 24.85 per cent of solid contents. Fermentation of 98 pounds crushed reached its maximum of 80°, after a violent fermentation, on October 15th. It was drawn off on October 22d, ten days from crushing. The yield from above amount was 6½ gallons, or at the rate of 137 gallons per ton.

RECORD OF TASTING, RACKING, ETC.—1887. *December 19.* Condition bright, with characteristic and very pronounced bouquet, well-proportioned acid, good astringency. A good wine.

1888. *January 19.* Racked the wine.

*February 9.* A sound, bright wine, with a well-developed aroma, heavy body, and light acid.

*May 5.* A heavy-bodied wine of casky taste, with its bouquet overpowered by the characteristic aroma.

*June 14.* The microscope shows in the sediment considerable lactic germs; racked and pasteurized the wine.

1889. *January.* Distilled for brandy, wine being in poor condition.

*No. 876. Cabernet Franc* (long-pruned). From J. T. Doyle, Cupertino. The grapes arrived October 2, 1888, and were crushed the same day. They were in excellent condition. Early coulure in some bunches, but no more than 2 per cent, and from that up to as much as 90 per cent. Bunches, owing to coulure, are not very characteristic; degree of ripeness very uneven, some bunches being very sweet and others not so. Very few dried grapes. Juice showed 23.34 per cent of solid contents.

*No. 877.* Same (short-pruned). From J. T. Doyle, Cupertino. The grapes arrived on October 2, 1888, and were crushed the same day. Their condition was the same as No. 876. Juice showed 22.92 per cent of solid contents. Fermented with No. 876. Fermentation reached its maximum of 93° on October 4th; it remained at this temperature about twelve hours, and was pressed on October 6th. From 75.5 pounds crushed 6.2 gallons were obtained, corresponding to 163.91 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 4.* Taken to cellar.

*December 12.* Wine clear, with well-developed bouquet; well-proportioned acid and tannin; quality high. An examination of the sediment under the microscope shows only a very faint trace of lactic ferment.

1889. *March 28.* Sediment showed small amount of lactic ferment; wine pasteurized.

*May 14.* Racked; condition clear.

*August 3.* Condition bright, with rather light and yellowish color, marked bouquet, well-developed flavor, clean taste, good body, low acid, good astringency, medium alcoholic strength, very good quality, but not enough color, strength, or acid for dilution.

*November 12.* Wine very good, but a little *passé*; bouquet not as marked as at last tasting; wine in bottles has a very good bouquet, and a better color, altogether a brighter and better wine than that in the keg.

1890. *February 5.* A microscopical examination of the lees shows no unsound germs.

*February 15.* Condition bright, with light color, very pleasant bouquet and flavor, but the wine has evidently passed maturity.

*March 10.* Racked.

1891. *February 12.* Wine bottled May 14, 1889, spoiled, but that bottled March 10, 1890, is bright, has no deposit; fair color, delicate bouquet, good flavor, clean and fresh taste; altogether a wine of good quality.

*No. 887. Cabernet Franc.* From Prof. E. W. Hilgard, Mission San José. The grapes arrived in good condition, October 9, 1888, and were crushed the same day. They were fully ripe; stems part dry, part green; considerable coulure (say 40 per cent) in bloom; some sunburnt

and partly dried berries, necessitating some picking over. Juice showed 23.92 per cent of solid contents. Fermentation of 98 pounds reached its maximum of 93.5° the next morning, where it remained till afternoon of the same day; it was pressed October 13th. The yield from the above amount was 7.9 gallons, corresponding to 160 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November*. Taken to cellar.

*December 14*. Racked; in a clear condition; developing well a characteristic bouquet; medium acid; good tannin; medium alcoholic strength and body; a good wine to drink as it stands.

Nos. 876 and 887. 1889. *January 12*. "Both very good. No. 887 heavy in color and tannin." (E. W. H. and F. P.)

*March 27*. Pasteurized, because sediment shows a small amount of lactic ferment.

*May 14*. Racked; condition clear.

*August 3*. Condition bright, with a good red color, tending to violet; very agreeable bouquet, smooth and pleasant flavor and taste; fair development, average acid and astringency, not high alcoholic strength; of good quality, and will stand well dilution with a little water.

1890. *February 8*. Under the microscope the sediment shows no unsound germs.

*February 16*. Condition bright, with marked and characteristic bouquet and flavor; a slight disagreeable flavor of wood, or of the water used for washing kegs; otherwise, quality high and mature.

*March 16*. Racked.

1891. *February 16*. Only a clear and fair wine; has much deposit and no bouquet; rebottled at date.

No. 1107. *Cabernet Franc*. From J. T. Doyle, Cupertino. The grapes arrived September 27, 1889, and were crushed the same day. Juice showed 26.10 per cent of solid contents. Their condition was not good, maturity being passed; there were many dried grapes, and the flavor of all was injured by overripeness. Fermentation reached its maximum of 89° on September 30th. The murk was drawn off October 1st, four days from crushing. From 85.5 pounds crushed 6.68 gallons were obtained, corresponding to 156.4 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 7*. Condition clear, with very good and characteristic bouquet and flavor, clean and well-developed taste, rather low acid, high astringency, adequate body and alcohol, general quality high. Racked and taken to cellar.

1890. *January 13*. Condition clear, with developed taste, and full-flavored; quality very good, but a little rough as yet.

*January 17*. The microscope shows no unsound germs in the sediment.

*April 7*. Racked.

*May 15*. Lees show some lactic germs, therefore the wine was pasteurized on May 29th.

*June 12*. Wine clear, but has acquired a burnt and slightly bitter taste.

*August 4*. Lees still contain lactic ferment.

*September 1*. The wine does not show improvement, but is not quite as bad as before; racked at date.

*December 30*. Lees badly tainted with lactic germs.

1891. *January 7*. Wine quite spoiled.

#### CABERNET SAUVIGNON.

The Cabernet Sauvignon is now sufficiently well known in most of the grape-growing regions of Central California to render a detailed description of the vine unnecessary. It is also well known that it enters in large proportion into the wines of Lafitte, Mouton, Latour, Leoville, and most of the "Grand Crûs" of Bordeaux clarets. The wine has a peculiar body, and, when mature, a great deal both of bouquet and natural perfume; it is a good keeper, maturing more slowly than the Cabernet Franc, generally requiring one year more than the latter in the cask before bottling.

The Cabernet Sauvignon is closely related to the Cabernet Franc, and

greatly resembles it in most respects; but it is readily distinguished by the peculiar appearance of the leaves, the lobes of which overlap.

The Cabernet Sauvignon resists rain quite as well as the Cabernet Franc; the berries are rather small, thick-skinned, and have the peculiar Cabernet flavor to a high degree. The vine bears chiefly on the ends of the canes, hence requires long-pruning; and in order to counteract the tendency to bearing at the ends only, the canes are advantageously bent, in training, on trellises. Thus trained, this variety bears fairly, two and a half tons per acre being no unusual crop after the fourth year.

The grafts at Mr. J. Gallegos', at Mission San José, and at Mr. Doyle's vineyard, at Cupertino, certainly showed fair vigor in growth; but at the former place there was practically no crop the second year from the graft, while at Cupertino they bore a very little. Third year grafts gave a crop, but much lighter than that of Cabernet Franc of the same age on its own roots. In 1890 (fifth year), however, vines trained on ample wire trellises have yielded Mr. Gallegos at the rate of nearly five tons per acre as the average of thirty acres.

## ANALYSES OF WINES.

| CABERNET SAUVIGNON.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Date of Picking.....                                                                 | MUST.                                                                |                                                                      |                                                      |                                                    | WINE.                                                          |                                                    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                 | Tannin.....                                                  | Total Acid as Tartaric.                              | Volatile Acid .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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| 1883—No. 139. H. W. Crabb, Oakville*<br>No. 140. J. H. Drummond, Glen Ellen*<br>1884—No. 214. Natoma Company, Natoma<br>1885—No. 409. Father Cichi, Santa Clara*<br>1886—No. 514. William Pfeiffer, Guberville<br>No. 607. J. B. J. Portal, San José*<br>No. 699. J. T. Doyle, Cupertino*<br>1887—No. 714. J. T. Doyle, Cupertino<br>No. 773. E. W. Hilgard, Mission San José<br>1889—No. 1113. E. W. Hilgard, Mission San José<br>1890—No. 1248. Margherita Vineyard, Fresno<br>No. 1342. John Gallegos, Mission San José<br>No. 1347. J. T. Doyle, Cupertino. | Sept. 23<br>Oct. 3<br>Oct. 9<br>Oct. 21<br>Sept. 29<br>Aug. 25<br>Oct. 11<br>Oct. 12 | 22.67<br>22.00<br>25.34<br>21.25<br>24.35<br>22.40<br>22.90<br>24.80 | 23.13<br>21.79<br>25.76<br>26.00<br>24.12<br>21.80<br>22.90<br>24.80 | .46<br>.68<br>.50<br>.30<br>.45<br>.65<br>.62<br>.40 | .32<br>.28<br>.48<br>.40<br>.32<br>.32<br>.26<br>. | 10.44<br>7.23<br>9.92<br>8.85<br>8.48<br>8.27<br>9.20<br>11.00 | 12.90<br>9.00<br>12.36<br>10.79<br>10.58<br>10.36<br>11.45<br>13.45 | .113<br>.093<br>.079<br>.167<br>.226<br>.226<br>.311<br>.384 | .39<br>.47<br>.50<br>.50<br>.52<br>.69<br>.57<br>.37 | .26<br>.22<br>.45<br>.319<br>.324<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<br>.<b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## COLOR READINGS.

|              |       | 1896.                        |                                    | 1897.                     |                                  | 1899.              |
|--------------|-------|------------------------------|------------------------------------|---------------------------|----------------------------------|--------------------|
|              |       | Wm. Pfeffer,<br>Gubersville. | J. B. J. Portal,<br>West San José. | John T. Doyle, Cupertino. | E. W. Hilgard, Mission San José. |                    |
|              |       | No. 514.                     | No. 607.*                          | No. 599.*                 | No. 714.                         | No. 773.           |
|              |       | No. 514.                     | No. 607.*                          | No. 599.*                 | No. 714.                         | No. 1113.          |
| Must         | Date  | Pale rose.                   | October.                           | October.                  | October 21.                      | October 1.         |
| At pressing  | Color | October 15.                  | October.                           | October.                  | 80.0 1 V. R.                     | November 1.        |
| One month    |       | 58.8 1 V. R.                 | October.                           | October.                  | 72.7 2 V. R.                     | 95.2 1 V. R.-V. R. |
| Two months   |       | 38.4 1 V. R.                 | October.                           | October.                  | 42.0 1-2 V. R.                   | 44.9 4 V. R.       |
| Three months |       | 38.2 1 V. R.                 | October.                           | October.                  | 37.4 1 V. R.                     | 43.0 2 V. R.       |
| Four months  |       | 25.0 3 V. R.                 | October.                           | October.                  | 38.0 3 V. R.                     | 43.6 1 V. R.       |
| Five months  |       | 29.8 2 V. R.                 | October.                           | October.                  | 38.0 3 V. R.                     | 46.5 1-2 V. R.     |
| Six months   |       | 29.8 2 V. R.                 | October.                           | October.                  | 13.9 2 R.                        | 38.0 1-2 V. R.     |
| Seven months |       | 30.7 2 V. R.                 | October.                           | October.                  | 13.9 2 R.                        | 38.0 1-2 V. R.     |
| Eight months |       | 30.7 2 V. R.                 | October.                           | October.                  | 13.9 2 R.                        | 38.0 1-2 V. R.     |

\* Wines sent for examination.

The above record shows that with a deep initial test of the violet-red order the Cabernet Sauvignon retains its color remarkably well, in quality as well as intensity. So soon as the tint verges toward the red proper, injury to the wine has surely occurred.



**No. 714. Cabernet Sauvignon.** From J. T. Doyle, Cupertino. The grapes arrived October 12, 1887, and were crushed the same day. Their condition was excellent; berries large, but the bunches showed fully 50 per cent early coulure. The "Cabernet" taste is very pronounced; berries very sweet, thick-skinned, ready to fall off. The juice showed 25.34 per cent of solid contents. Fermentation of 85.50 pounds crushed, after a vigorous fermentation, reached its maximum of 77° on October 16th; it was drawn off on October 21st, nine days from crushing, the yield from the above amount being 6½ gallons, or at the rate of 156 gallons per ton.

**RECORD OF TASTING, RACKING, ETC.—1887. December 19.** A bright-conditioned wine, of very characteristic bouquet, heavy body, medium acid, and high astringency.

1888. **January 18.** Racked from the lees.

**February 9.** Condition bright, with very characteristic bouquet, heavy body, medium acid, and quite high astringency. A good wine, but not as smooth as No. 716, Cabernet Franc.

**February 27.** A microscopical examination shows the sediment to have acetic germs; racked and pasteurized the sample.

**June 11.** Condition bright, with a fairly developed bouquet, but somewhat impaired by a slight acetous odor; acid high; alcohol and astringency both high.

Racked the wine again.

**No. 773. Cabernet Sauvignon.** From E. W. Hilgard, Mission San José. The grapes arrived October 24, 1887, and were worked the following day. Their condition was good, but rather overripe; much early coulure on bunches from high-trained vines. A few bunches came from vines detached by the wind, and lying on or near the ground, and have no coulure at all. The juice showed 25.50 per cent of solid contents. Fermentation of 21 pounds crushed reached its maximum of 84° on October 27th, and remained at a high temperature, with fermentation very vigorous, for seventy-two hours. It was drawn off on November 1st, seven days from crushing. The yield from the above amount was 1½ gallons.

**RECORD OF TREATMENT AND TASTING.—1887. December 20.** (In glass.) Condition bright, with characteristic bouquet, medium acid, very heavy body, and high astringency.

**December 22.** Racked the wine.

1888. **May 4.** (In glass.) A bright wine of well-developed, characteristic bouquet and sound, pleasant acid; quality high.

**No. 1113. Cabernet Sauvignon.** From Prof. E. W. Hilgard, Mission San José. This variety arrived October 1, 1889, in good condition, but somewhat past maturity, some grapes being dried up. It was crushed October 2d, the juice showing 24.35 per cent of solid contents. Fermentation of 52½ pounds crushed reached its maximum of 87.5° on October 4th; the murk was drawn off October 5th, three days from crushing. The yield from the above amount was 4.37 gallons, corresponding to 166.6 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1889. November 6.** Racked and taken to the cellar.

1890. **January 17.** Condition bright, with a peculiar and suspicious bouquet, a strongly characteristic flavor, rather flat taste, medium acid and alcohol, full astringency and body, quality good, but suspicion of unsoundness.

Lees contained no lactic germs, but an abundance of bitter ferment.

**May 12.** A bright-conditioned wine of strong characteristic flavor, but suspicious bouquet; pasteurized.

**June 13.** The wine tastes bitter; its general quality is only fair.

**August 4.** Lees show lactic germs.

**September 3.** A bright wine; much improved, but still tastes of lactic ferment. Racked again.

**December 30.** Lees show many lactic germs.

1891. **March 25.** The wine is about the same as at last tasting; the Cabernet character is marked, but spoiled by lactic flavor; it was rebottled at date.

*Discussion of Results.*

The table shows that as compared with most other red-wine grapes, the Cabernet Franc tends to be quite low in acid even with sugar percentages below 24 per cent; distinctly lower than in the Cabernet Sauvignon. Its tannin contents in the case of vines of the proper age is quite as high as is ordinarily desirable, and also distinctly lower than in the Cabernet Sauvignon. The same is true of its color, which, at pressing, appears to average about half the intensity of the Sauvignon. In the matter of body extract it seems to be but little behind the latter, and certainly the wines have all the character of "heavy body." On the whole, it may be said that the Cabernet Franc makes *by itself* a more palatable, as well as a more quickly maturing wine, than the Sauvignon, which requires blending to subdue its too pronounced character. Neither, however, will bear dilution without serious loss of character.

The keeping qualities of the wine are excellent, and it is excelled in this respect but by few, if any, grapes grown in California. This fact alone should commend it strongly to the attention of those who desire to deal in high-class wines that are to be allowed the proper time for full maturity. As to bearing qualities, my personal experience is that it is rather more delicate than the Sauvignon, and should be planted with a view to protection against both hot winds and sunburn, with more care than is required for the latter variety. The record shows that the low production of the vine in the three years represented in the table was distinctly due to "early" coulure; that is, sunburn while in bloom; not nearly as bad, however, as in the Malbeck and Merlot. It should not, therefore, have a southern exposure in warm localities, and probably should be planted in rows sufficiently close to insure mutual shading—say, five to six feet instead of eight, as is now usually done.

**TANNAT.**

The Tannat, properly so called, belongs to a very restricted area in the French Pyrenées, it being the most noted vine of the Madiran region, where it is associated with the Mansenc and Bouchy in the production of the high-grade red wines. It is a vigorous and productive vine, and is always pruned long, whether on high stakes or trellises. The conico-cylindrical, strongly-shouldered bunches are rather large and close; the berries round, medium-sized; they assume a fine black tint when ripe, and are very rich in coloring matter and tannin; very sweet, but somewhat astringent. The qualities ascribed to the Tannat in France are fully maintained where it has been planted in California, which is as yet to a very limited extent. It is not easily injured by dry heat, is a fair bearer, and its berries mature uniformly and well. Its deep and persistent color and heavy supply of tannin render it most valuable as an ingredient for blending with many of the prominent varieties now grown that are deficient in these points, and the quality of its wine is such as to improve all but, perhaps, the highest grades of the Bordeaux type. It should, however, be kept in mind that its wine is of somewhat slow maturity, and will maintain a certain roughness longer than most of the other Bordeaux varieties, except, perhaps, Cabernet Sauvignon. The proportion used in blends should therefore not be too large when early maturity of the wines is desired.

The average maturity of the Tannat appears to be quite two weeks later than the Cabernet Sauvignon, a point to be kept in mind when locating the vines with respect to exposure.

## ANALYSES OF WINES.

| TANNAT.                                            | Date of Picking..... | MUST.     |                        |                        |                                | WINE.           |             |                             |                     |
|----------------------------------------------------|----------------------|-----------|------------------------|------------------------|--------------------------------|-----------------|-------------|-----------------------------|---------------------|
|                                                    |                      | Ash ..... | Acid as Tartaric ..... | Sugar by Copper Test.. | Solid Contents by Spindle..... | Alcohol.        | Tannin..... | Total Acid as Tartaric.     | Volatile Acid ..... |
|                                                    |                      |           |                        |                        |                                | By Volume ..... |             | At Six to Eight Months..... |                     |
|                                                    |                      |           |                        |                        |                                | By Weight ..... |             | At Pressing .....           |                     |
| 1883—No. 143. H. W. Crabb, Oakville*               |                      |           |                        |                        |                                | 10.07           | .200        |                             |                     |
| No. 143a. J. H. Drummond, Glen Ellen*              |                      |           |                        |                        |                                | 8.55            | .180        | .40                         | .29                 |
| 1884—No. 217. H. W. Crabb, Oakville.....           | Oct. 18              | .29       | .81                    | 21.15                  | 21.52                          | 7.48            | .170        | .48                         | .34                 |
| 1886—No. 524. W. Pfeffer, Guberville .....         | Oct. 12              | .32       | .97                    | 24.12                  | 24.30                          | 19.70           | .320        | .63                         | .35                 |
| 1887—No. 726. J. P. Smith, Livermore .....         | Oct. 10              | .38       | .75                    | 22.67                  | 23.32                          | 9.12            |             | .63                         |                     |
| 1889—No. 1169. J. T. Doyle, Cupertino .....        | Oct. 12              | .24       | .58                    | 23.13                  | 22.70                          | 8.62            | .280        | .13                         | .274                |
| 1890—No. 1302. J. Gallegos, Mission San José ..... | Oct. 5               | .28       | .63                    | 27.20                  | 27.20                          | 10.81           | .310        | .45                         | .290                |
| No. 1389. J. T. Doyle, Cupertino .....             | Oct. 18              | .28       | .90                    | 25.00                  | 25.00                          |                 | .237        | .39                         | .295                |
|                                                    |                      |           |                        |                        |                                |                 |             | No wine.                    | 3.50                |

\* Wines sent for examination. † December, 1886. ‡ June, 1887.

## COLOR READINGS.

| TANNAT.                  | 1886.                        |  | 1887.                      |  | 1889.                      |  |
|--------------------------|------------------------------|--|----------------------------|--|----------------------------|--|
|                          | Wm. Pfeffer,<br>Gubersville. |  | J. P. Smith,<br>Livermore. |  | J. T. Doyle,<br>Cupertino. |  |
|                          | No. 524.                     |  | No. 726.                   |  | No. 1169.                  |  |
| Must .....               | Rose.                        |  |                            |  |                            |  |
| At pressing { Date ..... | October 23.                  |  | October 19.                |  | October 19.                |  |
| { Color .....            | 51.4 2 V. R.                 |  | 46.0 1 V. R.               |  | 93.0 V. R.-1 V. R.         |  |
| One month .....          | 43.7 2-3 V. R.               |  |                            |  | 40.0 1-2 V. R.             |  |
| Two months .....         | 40.8 3 V. R.                 |  | 33.3 2 V. R.               |  | 32.0 1-2 V. R.             |  |
| Three months .....       |                              |  |                            |  | 33.0 1-2 V. R.             |  |
| Four months .....        | 40.8 3 V. R.                 |  | 17.0 4 V. R.               |  | 34.8 1 V. R.               |  |
| Five months .....        |                              |  |                            |  | 31.3 1 V. R.               |  |
| Six months .....         | 30.7 3 V. R.                 |  |                            |  |                            |  |
| Seven months .....       |                              |  | 13.3 3 R.                  |  |                            |  |
| Eight months .....       | 23.5 3 V. R.                 |  |                            |  |                            |  |

*No. 726. Tannat.* From J. P. Smith, Livermore. The grapes arrived October 13, 1887, and were crushed the same day. They were in excellent condition, stems full green as yet, but berries sweet and somewhat undersized. There was much coulure just after bloom, many bunches up to 50 per cent, others quite down to 10 per cent, and closely packed. Average coulure was about 20 per cent. Condition probably as good as was to be attained this year. The juice showed 23.32 per cent of solid contents. Fermentation of 82 pounds crushed reached its maximum of 83° on October 18th, and during that time was exceedingly active; then fell to that of the room (75°), and on October 19th was drawn off, six days from crushing. The yield was 5 $\frac{1}{4}$  gallons, or at the rate of 139 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 13.* A clear wine, fully dry and perfectly sound, with a peculiar flavor.

1888. *February 1.* Racked the young wine from the lees.

*February 16.* Condition bright, with rather undeveloped bouquet, medium acid, and pronounced astringency. Wine on the whole rather harsh, and maturing very slowly.

*April 6.* The sediment shows, under the microscope, slight amounts of lactic and acetic ferments; racked and pasteurized the wine.

*May 5.* A rather thin wine of little quality, with sharp acid and only fair bouquet.

*No. 1169. Tannat.* From J. T. Doyle, Cupertino. This variety arrived October 15, 1889, in good condition and ripe, some grapes being dried. It was crushed on the day of arrival. Juice showed 22.70 per cent of solid contents. Fermentation reached its maximum of 88° on October 18th. On October 19th, four days from crushing, the murk was drawn off, being quite dry. From 160.25 pounds crushed 8.5 gallons were obtained, corresponding to 160 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 11.* Racked and taken to cellar. 1890. *January 20.* Condition bright, with deep color, marked and pleasing bouquet, full, claret-like flavor, a clean taste, medium acid, and full astringency, body, and alcohol; quality very good, aside from roughness.

*January 29.* Lees sound.

*May 17.* Lees sound.

*May 23.* Racked the wine again.

*June 1.* Wine bright, with agreeable flavor and bouquet, and clean taste; still rough, but of good quality.

*July 31.* Lees sound.

*December 30.* Lees show a good deal of "pastorianus" ferment.

1891. *January 2.* Condition bright, with good violet color, delicate and pleasing flavor, rather low acid, and much diminished astringency; general quality good; well developed and finished.

*March 17.* Wine bottled May 23, 1890, is bright and sound and of good quality, and better than the same in keg. The latter was racked again at this date.

*Discussion of Results.*

It appears from the above tables, so far as they go, that the Tannat does not, on the whole, incline to reach as high sugar and alcohol contents as the Malbeck and Cabernets readily attain, and will, therefore, on the average, make lighter wines than these—a very high recommendation for this State, which suffers with too high alcoholic contents in its wines. The acidity inclines to be high and the body (extract) only moderate, always ranging below 3 per cent; while the tannin, notwithstanding the name of the variety, does not seem to attain any very high figures, at least in the young wines thus far tested.

From these results it would seem reasonable that *while wines of high grade are to be allowed time to mature*, the Tannat might be advantageously used as a blend for the Cabernets, with their very heavy body and excessive natural flavor. Contrary to outward appearances, the color of the Tannat wines does not seem to be more intense, and not quite as stable, as that of the Cabernet Sauvignon, at least; but, like the latter, it remains staunchly within the "violet-red" tints to the last. I think probable that the Tannat could advantageously be substituted in our claret plantations for the part which the Malbeck plays in the French vineyards; only, of course, it cannot be blended "in the vat," but only after the Cabernets have fermented dry.

The Tannat wines promise to be sturdy keepers, even with a relatively low alcoholic strength.

## SAINT MACAIRE.

This name is not found in the ampelographies, but through the kindness of Professor Pulliat, the French ampelographer, we learn that this variety is cultivated in the Bordelais region, especially in the locality of Saint Macaire, from which it is named.

It seems somewhat related to the Tannat, from which, however, it differs in leaf and canes, and also in the berries. It is somewhat liable to coulure, but when pruned long it appears to be quite a heavy and regular bearer. On the whole it seems to be a vigorous variety, and matures a few days after the Cabernet Sauvignon. It has thus far been planted only experimentally, but it seems likely that it will have a good future in the vinification of wines of the Bordeaux type; and, moreover, it shows that such type of wines might probably be obtained from it, even when planted in warm regions, where also it could be a good companion of the Gros Mansenc, which in such regions would have, in a greater degree, the same peculiarities.

TABLE OF PRODUCTION.

| SAINT MACAIRE. |                                            | Number of Vines.. | Total Weight of Grapes ..... | Average per Vine. | Date of Picking... |
|----------------|--------------------------------------------|-------------------|------------------------------|-------------------|--------------------|
| 1888—No. 910.  | J. T. Doyle, Experim'tal Plot, Cupertino.. | 13                | 110                          | 8.4               | Oct. 9             |
| 1889—No. 1159. | J. T. Doyle, Experim'tal Plot, Cupertino.. | 18                | 455                          | 25.27             | Oct. 9             |

## ANALYSES OF WINES.

|                | WINE.                       | MUST.                           | Date of Picking..... |                                      |
|----------------|-----------------------------|---------------------------------|----------------------|--------------------------------------|
|                |                             |                                 |                      |                                      |
|                | Ash .....                   | Ash .....                       |                      |                                      |
|                | Body .....                  | Acid as Tartaric .....          |                      |                                      |
|                | Volatile Acid .....         | Sugar by Copper Test..          |                      |                                      |
|                | Total Acid as Tartaric.     | Solid Contents by Spindle ..... |                      |                                      |
|                | At Six to Eight Months..... |                                 |                      |                                      |
|                | At Pressing .....           |                                 |                      |                                      |
|                | Tannin.....                 |                                 |                      |                                      |
|                | Alcohol.                    |                                 |                      |                                      |
|                | By Volume.....              |                                 |                      |                                      |
|                | By Weight .....             |                                 |                      |                                      |
| 1888—No. 910.  |                             |                                 | Oct. 9               | John T. Doyle, Cupertino.....        |
| 1889—No. 1159. |                             |                                 | Oct. 9               | John T. Doyle, Cupertino.....        |
| 1889—No. 1179. |                             |                                 | Oct. 14              | John Gallegos, Mission San José..... |
| 1890—No. 1295. |                             |                                 | Oct. 1               | John Gallegos, Mission San José..... |
| 1890—No. 1281. |                             |                                 | Sept. 30             | John T. Doyle, Cupertino.....        |

SAINT MACAIRE.

## COLOR READINGS.

| SAINT MACAIRE.           | 1888.                     |           | 1889.                             |  |
|--------------------------|---------------------------|-----------|-----------------------------------|--|
|                          | John T. Doyle, Cupertino. |           | J. Gallegos,<br>Mission San José. |  |
|                          | No. 910.                  | No. 1159. | No. 1179.                         |  |
| Must -----               | October 16.               |           | October 14.                       |  |
| At pressing { Date ----- | 95.2 1-2 V. R.            |           | 117.6 1 V. R.                     |  |
| { Color -----            | 59.7 1 V. R.              |           | 100.0 V. R.                       |  |
| One month -----          | 57.1 1 V. R.              |           | 63.5 1 V. R.                      |  |
| Two months -----         | 56.3 1 V. R.              |           | 63.5 1 V. R.                      |  |
| Three months -----       | 48.2 1 V. R.              |           | 58.8 1 V. R.                      |  |
| Four months -----        | 30.7 1 V. R.              |           | 57.1 1 V. R.                      |  |
| Five months -----        | 30.7 1 V. R.              |           |                                   |  |
| Six months -----         |                           |           |                                   |  |
| Seven months -----       | 36.4 1 V. R.              |           |                                   |  |

*No. 910. Saint Macaire.* From J. T. Doyle, Experimental Plot, Cupertino. Grapes arrived in good condition on October 12, 1888, and were crushed the same day. Bunches compact; some loose, owing to coulure, which amounted, in some cases, to as much as 80 per cent, and from that down to about 10 per cent. Those not affected by coulure are large and well shouldered; berries medium size and round; acid full; stems green. Juice showed 21.91 per cent of solid contents. Fermentation of 96.5 pounds crushed reached its maximum of 93° on October 14th. On October 16th, four days from crushing, the murk was drawn off. The yield from the above amount was  $7\frac{3}{8}$  gallons, corresponding to 152.9 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 3.* Taken to cellar.  
*December 17.* Racked; condition clear, with undeveloped bouquet, medium acid and alcohol, heavy body; wine sound, but somewhat rough.  
 1889. *January 9.* Wine not improved; taste suspicious.  
*January 12.* Not to be judged, on account of apparent unsoundness.  
*January 15.* Pasteurized.  
*March 29.* Racked.  
*May 16.* Racked again; condition clear; wine has deposited much sediment.  
*August 3.* Condition bright, with a good violet-red color, and very little developed bouquet; good aroma; a taste that recalls the Tuscan wines; astringency and alcohol well proportioned; quality good; stands 50 per cent dilution well.  
 1890. *February 10.* Lees heavy, with an abundance of bitter and lactic ferments.  
*February 15.* Wine has deteriorated greatly since last tasting; bouquet and flavor indicate lactic and bitter ferments.

*No. 1159. Saint Macaire.* From J. T. Doyle, Experimental Plot, Cupertino. This variety arrived October 10, 1889, in fair condition, and rather crushed from loose packing; berries were quite ripe. It was crushed the day of arrival, juice showing 21.50 per cent of solid contents. Bunches over-average in size, irregular and loose, coulure on some; grapes average or over-average in size, quite round; skin not thick and rather tough; flesh soft and juicy; taste acid and agreeable, but no special flavor; stems rather thin, green, and brittle; pedicels rather short and thick. Fermentation reached its maximum of 86° on October 12th. The murk was drawn off October 14th, four days from crushing, being quite dry. From 97.5 pounds crushed 7.9 gallons were obtained, corresponding to 162.7 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *December 13.* A bright, deep-tinted wine of poor bouquet, but marked flavor, with peculiar after-taste; full acid and alcohol, and of good quality.

December 9. Racked and taken to the cellar.  
 1890. January 24. Wine bright, and much improved in general quality. Lees show no unsound germs.  
 April 29. Racked.  
 May 20. Lees sound.  
 June 1. Wine clear, but having very little bouquet, and of fair quality.  
 July 31. Lees show much "*pastorianus*" ferment.  
 1891. January 2. A bright wine, much improved, but still deficient in bouquet and flavor.  
 March 12. The wine bottled April 29, 1890, is spoiled. Some more wine bottled again at this date.

No. 1179. *Saint Macaire*. From J. Gallegos, Mission San José. Grapes arrived October 16, 1889, in rather moldy condition; they were quite dry, and were crushed October 17th. The juice showed 23.05 per cent of solid contents. Bunches medium size, generally well shouldered, close, and sometimes compressed; grapes medium or over-medium, round; skin thick and hard, rich in color; flesh soft and juicy; juice white; stems medium size and dark colored; pedicels medium length and rather slender; maturity complete. Fermentation of 92 pounds crushed began October 18th, and reached its maximum of 83° October 19th. The murk was drawn off on October 21st, four days from crushing. The yield from the above amount was  $6\frac{1}{8}$  gallons, corresponding to 148.1 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. December 9. Condition not quite bright, with a very dark color, undeveloped bouquet, an agreeable flavor, clean taste, full acid, astringency, and alcohol, and medium body; quality good.

December 9. Racked and taken to cellar.  
 1890. January 24. A bright wine of undeveloped bouquet, and of improved general quality, although still raw; lees sound.  
 May 1. A wine sample in bottle contains lactic acid.  
 May 3. Wine in keg tastes somewhat of lactic ferment, but was bright. Racked again.  
 May 8. Pasteurized.  
 June 12. A bright wine, with little bouquet; the lactic taste has diminished, but the wine is somewhat flat.  
 August 4. The sediment is full of lactic germs.  
 September 3. A bright and fair wine.

### Discussion of Results.

In glancing at the above records, so far as they go, we see that the Saint Macaire produces about the same amount of sugar as the Tannat, with a rather high percentage of acidity, of tannin, and of color; the latter is well maintained in the wine. However, we do not know whether this difference will be maintained when both grapes have been tested longer and with the products from older vines. In any case, the Saint Macaire is a grape which will answer very well, for the making of wines of the Bordeaux type, in those regions where such wines can be produced with their proper qualities; however, it is probable that it may be used, either alone or blended with the Gros Mansenc, in making dry clarets, in warmer regions, such as the Fresno district.

### MERLOT.

The Merlot is altogether a grape of the Bordeaux region, and is planted, as well as blended, more or less with the high-quality wines, especially the Cabernets. It matures earlier than the latter, and is therefore planted on northern exposures in order to retard maturity.



The very dark-tinted grape is very sweet and agreeable, neutral in flavor, but very delicate, and must be gathered as soon as ripe; the wine, also, is delicate, lighter than those of the Cabernets, and matures more quickly, but does not attain as high quality. It is pruned more or less long, according to the vigor of the vine, which is quite productive when not affected by coulure.

The Merlot has thus far been planted in California only to a very limited extent, mainly in the Santa Clara and Livermore Valleys, where its product has been very fine in quality, but somewhat scant in quantity, especially during the dry seasons of 1888 and 1889. It has shown both its bloom, fruit, and leaves to be very much subject to damage from hot, dry winds, and in 1888 was found (at Cupertino) to be almost leafless, and its few remaining grapes sunburnt, as early as the middle of August. This peculiarity renders it a very uncertain bearer, and its use is advisable only in locations protected from hot winds and under commercial conditions that promise adequate reward for high quality. At Cupertino it produced, at the age of four years from the graft on vigorous Charbono vines, at the maximum rate of three and a half pounds to the vine in 1889, equal to about one and one fifth tons per acre. At Mission San José, particularly in Mr. McIver's vineyard, on a western slope, the production seems to have been more satisfactory; and the same is reported from some localities in the Livermore district. Such differences are doubtless due to greater or less exposure to sunburn and hot winds, as well as to the accidents of the seasons during which the grape has been tested.



## COLOR READINGS.

|                   | 1886.                                |                                    | 1887.                      | 1888.                                |                         | 1889.                                |
|-------------------|--------------------------------------|------------------------------------|----------------------------|--------------------------------------|-------------------------|--------------------------------------|
|                   | J. Gallegos,<br>Mission San<br>José. | C. McIver,<br>Mission San<br>José. | J. T. Doyle,<br>Cupertino. | J. Gallegos,<br>Mission San<br>José. | J. T. Doyle, Cupertino. | J. Gallegos,<br>Mission San<br>José. |
|                   | No. 579.*                            | No. 617.*                          | No. 734.                   | No. 859.                             | No. 868.                | No. 1120.                            |
| Must.....         | October.                             | October.                           | October 25.                | Carmine.                             | Pale rose.              | October 7.                           |
| At pressing {     | October.                             | October.                           | October 25.                | October 1.                           | October 2.              | October 1.                           |
| Color {           | 31.5 5 V. R.                         | 50 4 V. R.                         | 41.0 3 V. R.               | 53.3 2 V. R.                         | 65.5 1 V. R.            | 75.5 1 V. R.                         |
| One month.....    | 31.5 5 V. R.                         | 50 4 V. R.                         | 26.2 2-3 V. R.             | 42.1 2 V. R.                         | 40 2 V. R.              | 40 3 V. R.                           |
| Two months.....   | 31.5 5 V. R.                         | 50 4 V. R.                         | 26.2 2-3 V. R.             | 43 2 V. R.                           | 32.5 2 V. R.            | 17.2 5 V. R.                         |
| Three months..... | 31.5 5 V. R.                         | 50 4 V. R.                         | 26.2 2-3 V. R.             | 43 2 V. R.                           | 32.5 2 V. R.            | 40 3 V. R.                           |
| Four months.....  | 31.5 5 V. R.                         | 50 4 V. R.                         | 26.2 2-3 V. R.             | 43 2 V. R.                           | 32.5 2 V. R.            | 17.2 5 V. R.                         |
| Six months.....   | 31.5 5 V. R.                         | 50 4 V. R.                         | 26.2 2-3 V. R.             | 43 2 V. R.                           | 32.5 2 V. R.            | 17.2 5 V. R.                         |
| Eight months..... | 31.5 5 V. R.                         | 50 4 V. R.                         | 26.2 2-3 V. R.             | 43 2 V. R.                           | 32.5 2 V. R.            | 17.2 5 V. R.                         |

\* Wines sent for examination.

*No. 734. Merlot.* From J. T. Doyle, Cupertino. The grapes arrived October 14, 1887, and were crushed the following day. Condition apparently good, but a little overripe. Bunches small and very badly coulored, fully 50 per cent on an average. Berries rather dry. The juice showed 25.95 per cent of solid contents. Fermentation of 19.50 pounds crushed reached its maximum of 80° on October 16th, and remained at that point for forty-eight hours. October 25th the murk was drawn off. The yield from the above amount was 1½ gallons, or at the rate of 150 gallons per ton.

On racking, the wine proved to have so strong a taste of mold that its further development offered no interest.

*No. 859. Merlot.* From J. Gallegos, Mission San José. Grapes received September 25, 1888, in good condition, but in very small quantity. Juice showed 24.24 per cent of solid contents. Eleven pounds yielded .87 gallons of wine, or at the rate of 159.1 gallons per ton.

RECORD OF TREATMENT AND TASTING.—(In glass all the time.) At racking, November 19th, bouquet was very well developed, flavor vinous, tannin and acid well proportioned.

1889. *April 3.* Racked; not quite clear.

*August 5.* Wine bright, dark red, light, rather thin, but with full astringency; normal acid, light bouquet; will not stand dilution.

1890. *March.* Wine bright and of good general quality, with good color and agreeable acidity.

The youth of the vines from which these grapes came makes itself felt in the above record.

*No. 868. Merlot.* From J. T. Doyle, Cupertino. The grapes arrived September 28, 1888, and were worked the same day. Condition good, not overripe; very few dried berries; early and late couloure damaged the crop. On some bunches early couloure amounts to 75 per cent. No sunburn, but very few typical bunches. Juice showed 23.76 per cent of solid contents. Thirty-seven pounds yielded 3¾ gallons, corresponding to 209 gallons per ton.

It is notable that these grapes were much more juicy than those of the same year from Mission San José (No. 859, above); perhaps because coming from older vines.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Racked and removed to cellar.

1889. *January 2.* Racked; wine almost bright; acid normal; bouquet well developed for being in glass; tannin high; a good wine.

*April 3.* Racked; clear and of good color. Pasteurized.

*June 1.* Racked again.

*August 3.* Condition bright, with a very dark red color; a pronounced bouquet; pleasant flavor like Cabernet; a clean taste and good body; an adequate acid and astringency, and full alcohol; quality good; dilutes well up to 100 per cent of water.

*November 4.* Flavor of Cabernet more marked than at last tasting, August 3d, but condition not altogether satisfactory.

1890. *March 10.* Wine bottled.

1891. *February 1.* Clear, little sediment; bouquet and flavor pleasing, but slight lactic after-taste.

It will be noticed that this wine had a considerably heavier body and more tannin than that of the same vintage from Mission San José, the vines being older.

*No. 1109. Merlot.* From J. T. Doyle, Cupertino. The grapes came September 27, 1889, and were crushed the same day, the juice showing 25.10 per cent of solid contents. They were in fair condition, but overripe, there being many dried and half-dried grapes; bunches were loose and straggling from couloure. Fermentation reached its maximum of 88.5° on September 30th. The murk was drawn off October 1st, four days from crushing. Ninety-five and one half pounds produced 7.62 gallons, corresponding to 159.7 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 7.* Bright, with marked bouquet; a flavor like Cabernet Franc, but less marked; clean taste, high astringency, full body, and medium acid; general quality good, but less advanced than Cabernet of same vintage.

*November 27.* Racked and taken to cellar.

1890. *January 17.* Bright, with much developed bouquet and flavor; of smooth quality and very agreeable; lees sound.

*April 7.* Racked.

*May 14.* Pasteurized.

*June 12.* Pleasing bouquet and flavor, clean taste, and good development; general quality good.

Despite pasteurization a little lactic ferment continued to form in the wine, as observed August 4th and December 2d.

1891. *January 2.* Bright, with good bouquet and flavor, and general quality very good, but with a slight lactic after-taste.

*No. 1120. Merlot.* From J. Gallegos, Mission San José. The grapes arrived October 1, 1889, in good condition, except for overripeness, there being many dried grapes. They were crushed October 2d, the juice showing 24.80 per cent of solid contents. Fermentation reached its maximum of 90.5° on October 5th. The murk was drawn off October 7th, four and one half days from crushing. The 70.5 pounds crushed gave 5.81 gallons, corresponding to 162.6 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 6.* Racked from lees and taken to cellar.

1890. *January 17.* Clear, with a color of medium depth; bouquet not good; peculiar flavor, recalling ale; clean taste; medium acid, full astringency, body, and alcohol; quality rather good, but rough. Lees contain only a few alcoholic ferments.

*April 8.* Racked; condition clear.

*April 30.* Bright and sound.

*May 15.* Lees sound.

*June 13.* Clear; bouquet not quite sound; flavor good, but taste slightly bitter.

By *January 7, 1891*, this wine, which was very promising but had not been pasteurized, was completely spoiled by lactic fermentation.

### *Discussion of Results.*

From the data in the above table it appears that, apart from the grapes from very young vines (in 1884 and 1885), the Merlot tends to have a higher percentage of sugar, and therefore of alcohol, the average of the latter being over 12½ per cent. The acid in the must and wines is almost throughout rather low, and thus it may be expected that the fermentation would be benefited by blending in the vat with more acid grapes; the more, as the wine, alone, appears to be somewhat difficult to keep.

The tannin in the wines from the older grapes is quite full, approaching .30 per cent, hence need not be increased in blending.

The body, or extract, is heavy in all the wines from older stocks, alike from both sides of the Santa Clara Valley. From the Santa Cruz Mountains a lower body is to be expected; the Natoma wines were bearing their first crop. The Merlot wines may therefore be counted as "heavy" in every respect.

In regard to color, an inspection of the table shows that while the wine may start out with a very deep tint, it nevertheless may fall very low in some years, while in others a less degree of initial color leaves a considerably deeper tint in the end. On the whole, however, the Merlot may count as a heavy-tinted grape, whose color can doubtless be maintained by proper blending in the vat, or soon after

## VERDOT.

Like the Merlot, the Verdot belongs exclusively to the vineyards of the Bordeaux region, and is there cultivated in the low ground, in whose strong, clayey soils this grape yields better products than any other. It is the latest ripening grape of the region, and is, for this reason, always gathered and treated by itself. It is only moderately productive, and is therefore mostly pruned long, although it does not resent short-pruning. In its propagation the strongest wood should be carefully selected. The Verdot wine is a good keeper, and is especially esteemed for export, but does not usually form an ingredient of high-class wine.

The Verdot has only been planted to a limited extent in California thus far, most largely perhaps in the Livermore Valley, where it has also proved to be a fair bearer. At the Cupertino Experimental Plot it yielded an enormous crop in 1886 (80 pounds to the vine), but since that time has uniformly failed to give more than a very moderate product in that upland plantation, to which it is probably not very well adapted. Its success in rich, low ground appears not to have been as yet fully tested in this State. It is perhaps from that cause, that its relative epoch of maturity appears considerably earlier than is the case in the Bordeaux region, so that it would be quite possible to make grape-blends in the vat with the Cabernets, instead of fermenting it alone, as in the Bordeaux practice. For the present, it is still doubtful that, with its liability to sunburn of leaves and coulure of bloom, it can be recommended for general culture. There are doubtless localities where, as in the "palus" of the Bordelais, it will be found to be the best variety for profit.

TABLE OF PRODUCTION.

| VERDOT.                                                                     | Number of Vines.. | Total Weight of Grapes, in lbs.... | Average per Vine, in lbs..... | Date of Picking... |
|-----------------------------------------------------------------------------|-------------------|------------------------------------|-------------------------------|--------------------|
| 1887—No. 743 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino..... | 20                | 142                                | 7.10                          | Oct. 17            |
| No. 744. J. T. Doyle, Experimental Plot, Cupertino.....                     | 20                | 20                                 | 1.10                          | Oct. 11            |
| Row 55. J. T. Doyle, Experimental Plot, Cupertino.....                      | 20                | 12                                 | .60                           | Oct. 19            |
| 1888—No. 926 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino..... | 19                | 65                                 | 3.40                          | Oct. 22            |
| No. 927 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino.....       | 20                | 135                                | 6.80                          | Oct. 22            |
| No. 928 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino.....       | 20                | 70                                 | 2.50                          | Oct. 22            |
| 1889—No. 1150. J. T. Doyle, Experimental Plot, Cupertino.....               | 18                | 200                                | 11.11                         | Oct. 8             |

## ANALYSES OF WINES.

| VERDOT.                                               | MUST.           |                           |                        |                       | WINE.     |                 |                |             |                         |                             |                     |            |           |
|-------------------------------------------------------|-----------------|---------------------------|------------------------|-----------------------|-----------|-----------------|----------------|-------------|-------------------------|-----------------------------|---------------------|------------|-----------|
|                                                       | Date of Picking | Solid Contents by Spindle | Sugar by Copper Test.. | Acid as Tartaric..... | Ash ..... | Alcohol.        |                | Tannin..... | Total Acid as Tartaric. |                             | Volatile Acid ..... | Body ..... | Ash ..... |
|                                                       |                 |                           |                        |                       |           | By Weight ..... | By Volume..... |             | At Pressing .....       | At Six to Eight Months..... |                     |            |           |
|                                                       |                 |                           |                        |                       |           |                 |                |             |                         |                             |                     |            |           |
| 1884—No. 216. Natoma Company, Natoma                  | Sept. 17        | 23.04                     | 23.04                  | .66                   | .31       | 9.78            | 11.82          | .070        | .52                     | .44                         |                     | 2.77       | .41       |
| 1886—No. 551. J. T. Doyle, Cupertino                  | Oct. 22         | 20.90                     | 19.89                  | 1.09                  | .34       | 7.92            | 9.90           | .170        | .79                     |                             |                     |            |           |
| 1887—No. 614. C. C. McIver, Mission San José*         |                 |                           |                        |                       |           | 7.43            | 9.30           |             |                         | .66                         |                     | 2.22       | .29       |
| 1887—No. 743 (short-pruned), John T. Doyle, Cupertino | Oct. 17         | 24.72                     | 24.64                  | .75                   | .49       | 9.92            | 12.36          | .223        |                         | .57                         |                     | 3.10       |           |
| 1887—No. 744 (long-pruned), John T. Doyle, Cupertino  | Oct. 17         | 23.82                     | 22.67                  | .85                   | .37       | 9.92            | 12.36          | .280        | .72                     | .68                         |                     | 2.80       |           |
| 1888—No. 926 (short-pruned), John T. Doyle, Cupertino | Oct. 22         | 26.09                     | 28.33                  | .63                   | .56       | 9.56            | 11.91          | .290        | .85                     | .54                         |                     | 3.10       |           |
| 1888—No. 927 (long-pruned), John T. Doyle, Cupertino  | Oct. 22         | 26.09                     | 28.33                  | .64                   | .52       | 10.26           | 12.73          | .297        | .71                     | .71                         |                     | 3.40       |           |
| 1888—No. 928. John T. Doyle, Cupertino                | Oct. 22         | 26.06                     | 26.99                  | .63                   | .42       | 9.20            | 11.45          | .298        | .56                     | .71                         |                     | 3.10       |           |
| 1889—No. 1150. John T. Doyle, Cupertino               | Oct. 8          | 25.40                     | 24.95                  | .71                   | .47       | 9.92            | 12.36          | .338        | .57                     | .54                         |                     | 2.95       |           |
| 1890—No. 1223. Margherita Vineyard, Fresno            | Aug. 25         | 23.70                     | 23.62                  | .57                   | .33       | 9.70            | 12.09          | .278        | .41                     | .57                         | No wine.            | 3.08       | }         |
| No. 1250. Margherita Vineyard, Fresno                 | Aug. 25         | 24.10                     | 23.62                  | .57                   | .27       |                 |                |             |                         |                             |                     |            |           |
| No. 1369. John T. Doyle, Cupertino                    | Oct. 14         | 25.90                     |                        | .83                   |           | 9.92            | 12.36          | .320        |                         | No wine.                    | }                   | 3.32       | }         |
| No. 1331. John T. Doyle, Cupertino                    | Oct. 11         | 21.50                     |                        | .92                   |           |                 |                |             |                         |                             |                     |            |           |
| No. 1382. John Gallegos, Mission San José             | Oct. 18         | 25.00                     |                        | .99                   | .25       |                 |                |             |                         | .39                         |                     |            |           |

\* Wines sent for examination.

## COLOR READINGS.

| GROS VERDOT.      | 1886.                      |                                       | 1887.                        |                              | 1888.                        |                               | 1889.                        |  |
|-------------------|----------------------------|---------------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|--|
|                   | J. T. Doyle.<br>Cupertino. | C. C. McIver,<br>Mission San<br>José. | John T. Doyle, Cupertino.    |                              |                              |                               |                              |  |
|                   | No. 551.                   | No. 614.*                             | No. 743<br>(short-pruned).   | No. 744<br>(long-pruned).    | Nos. 926-927.                | No. 928.                      | No. 1150.                    |  |
| Must.....         | Rose.                      |                                       | October 24.<br>100.0 1 V. R. | October 27.<br>143.0 1 V. R. | October 27.<br>123.0 2 V. R. | October 27.<br>78.4 1-2 V. R. | October 14.<br>102.6 1+V. R. |  |
| At pressing {     | November 3.                |                                       | 100.0 1 V. R.                | 143.0 1 V. R.                | 74.1 1 V. R.                 | 59.7 1-2 V. R.                | 71.4 1-2 V. R.               |  |
| Date.....         | 61.5 2 V. R.               |                                       | 48.1 V. R.                   | 100.0 V. R.                  | 68.9 1 V. R.                 | 62.5 2 V. R.                  | 34.8 1+V. R.                 |  |
| One month.....    | 71.0 2 V. R.               | 57.1 2 V. R.                          | 45.9 1 V. R.                 | 60.0 1-2 V. R.               | 63.0 1 V. R.                 | 53.3 2 V. R.                  | 36.3 1+V. R.                 |  |
| Two months.....   | 57.0 2 V. R.               | 55.5 3 V. R.                          | 40.0 1 V. R.                 | 40.0 2 V. R.                 | 44.4 2 V. R.                 | 47.0 1-2 V. R.                | 25.3 2 V. R.                 |  |
| Four months.....  | 50.0 2 V. R.               |                                       |                              |                              |                              |                               | 21.4 2 V. R.                 |  |
| Six months.....   |                            |                                       |                              |                              |                              |                               |                              |  |
| Seven months..... |                            |                                       |                              |                              |                              |                               |                              |  |
| Eight months..... |                            |                                       |                              |                              |                              |                               |                              |  |

\* Wines sent for examination.



*No. 743* (short-pruned). *Gros Verdot*. From J. T. Doyle, Cupertino. The grapes arrived October 18, 1887, and were crushed the following day. Their condition was excellent, but with a number of dried berries. The berries were quite large for the variety, *i. e.*, medium size, and very sweet. Bunches large and compact, little coulure. The juice showed 24.72 per cent of solid contents. Fermentation of 27.5 pounds crushed began on October 20th, continued very violently, and reached its maximum of 81° on October 22d. It was drawn off on October 24th, five days from crushing. The yield from the above amount was 1½ gallons, or at the rate of 113.46 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 2*. The wine was racked from the lees.

*December 20*. Condition bright, with bouquet fairly developed; medium body, pleasant and normal acid, and low astringency.

1888. *February 16*. Condition bright, with a good amount of acid; astringency not high; general quality of the wine high.

*June 4*. In glass; in an almost bright condition, with an excellent bouquet; adequate astringency; of high quality, with no unpleasant after-taste. The sediment shows just a trace of lactic ferment with the microscope. The wine was racked again.

*No. 744* (long-pruned). *Gros Verdot*. From J. T. Doyle, Cupertino. The grapes arrived October 18, 1887, and were crushed the following day. Their condition was only fair, a large proportion being dried unripe; the berries were much smaller than the short-pruned, and apparently considerably more acid, or less sweet, or both. Coulure more than with the short-pruned—say 15 per cent. The juice showed 24.95 per cent of solid contents. Fermentation of 112 pounds crushed began on October 20th, and reached its maximum of 86° on October 22d. It was drawn off on October 27th, eight days from crushing. The yield from the above amount was 8½ gallons, or at the rate of 154 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 20*. Wine heavy-bodied and acetified. Racked and pasteurized the wine.

1888. *February 8*. Condition bright, with a beautiful ruby color, remarkably well-developed bouquet, and high astringency. In its present condition a fair claret for direct consumption.

*June 19*. Condition bright, with very deep color, well-developed bouquet, sharp acid (acetic), and heavy body. The after-taste is unpleasant and the quality is only fair, aside from the acetic acid.

A microscopic examination of the sediment shows a few acetic and lactic germs. Racked the wine again.

1889. *November*. Condition bright, with a good, deep-red color, a strong and peculiar bouquet, rather agreeable flavor, mature taste, good body, and high acid and astringency; its alcoholic strength is full, and quality rather good.

*Nos. 926 and 927*. *Gros Verdot*. From J. T. Doyle, Cupertino. The grapes arrived on October 23, 1888, in good condition, and were fermented together. (For the description of grapes, see No. 928.) Fermentation commenced October 23d, and reached its maximum of 94° on October 26th, continuing at 81.5 till October 27th, when the murk was drawn off. The rate of wine obtained corresponded to 158.28 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 5*. Taken to cellar.

*December 18*. Racked; wine and lees sound, with 11.5 per cent of alcohol; a heavy body; good amount of tannin; 5.5 per cent of acid; quality very good; bouquet not developed.

1889. *March 27*. Sediment shows a small amount of lactic germs. The wine was pasteurized.

*May 14*. Racked; in good order.

*August 3*. Condition bright, with good, dark violet-red color, an agreeable bouquet,

clean and pleasant flavor and taste, good body, medium acid and astringency, full alcoholic strength; quality rather good; stands 100 per cent dilution very well.

*November 5.* Condition bright, with dark color, marked and agreeable bouquet, very pleasant flavor; sound and developed taste, and good body; a medium acid and astringency, and full alcohol; general quality improved in bottle.

*1890. February 10.* Lees sound.

*February 26.* Condition bright, with well-developed bouquet; of good quality, but still rather coarse and immature.

*February 27.* Racked again.

*March 10.* The wine from keg was electrified for one half hour and one hour, making thus two samples, called, respectively, A and B.

*July 18.* Sample A, treated one half hour, contained bitter and acetic germs; while sample B, treated one hour, was sound.

*July 24.* Sample A has less bouquet and less acid than B; otherwise the same. Sample B is bright, of good color, with a marked and pleasing bouquet, full flavor and acid; body and general quality good.

*August 14.* The samples A and B were bottled.

*1891. March 2.* The wine bottled March, 1890, is bright, full, rich in bouquet and flavor; quality very fresh; drinkable and well-matured wine. The samples A and B electrified and bottled August 14, 1890, have both less bouquet and less flavor than the above, and they are altogether of inferior quality.

*No. 928. Petit Verdot.* From J. T. Doyle, Cupertino. The grapes arrived October 23, 1888, in good condition, and were crushed the same day. There were a few dried grapes, but the stems were generally green and the berries ripe and quite acid, as yet unlike the Gros Verdot, which is very sweet and partially overripe. Berries very notably smaller than the Gros Verdot, and if anything a little thin-skinned. Weighing of twenty-five berries show a difference of nearly 50 per cent in the weight of the two varieties. Petit Verdot has more sunburn than the Gros Verdot. The juice shows 26.06 per cent of solid contents. Fermentation\* of the 52 pounds received started October 24th (room, 92°), reached its maximum of 102° on October 25th; continuing till October 27th, when the murk was drawn off. The yield from the above amount corresponded to 139.42 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 22.* Placed in cellar.

*December 14.* Lees show traces of lactic germs.

*December 17.* Wine was pasteurized.

*1889. January 12.* No. 927-928. Both good, and of higher quality than its French reputation seems to warrant.

*February 27.* Racked; sediment shows some dead lactic germs.

*August 3.* Condition bright, with a dark-red color and no bouquet; the flavor is flat, and the taste not good; acid and alcoholic strength medium, but full astringency; quality not good; injured by being in too small a keg.

*1890. February 10.* Lees show much bitter ferments.

*February 13.* Condition of wine bright, but not improved since last tasting.

*March 7.* Racked again.

*July 18.* As the wine had not improved since last tasting, and the sediment was still full of bad germs, it was distilled at date.

*No. 1150. Gros Verdot.* From J. T. Doyle, Cupertino. The grapes arrived October 9, 1889, and were crushed the same day, the juice showing 25.40 per cent of solid contents. Their condition was fair, and maturity complete; they were picked the day after a heavy rain. The bunches were medium size, long, branching, and loose; grapes round, and medium size; skin not very thick, but tough and dark colored; flesh soft and juicy; juice pink and acid; long, slender, and green stems; long and slender pedicels. Fermentation commenced October 10th, and reached its maximum of 86.5° October 12th, continuing gently till October 14th, four and a half days from crushing, when the murk was drawn off, being quite dry. From 85.5 pounds were obtained 7.44 gallons, corresponding to 173.8 gallons per ton.

\* Fermented in hot box.

RECORD OF TREATMENT AND TASTING.—1889. *December 3.* Bright and dark colored, with not marked bouquet; agreeable flavor; smooth taste, full acid, and astringency full; medium body; quality good.

*December 4.* Racked and taken to cellar.

1890. *January 23.* Bright; bouquet much developed; since December 3d general quality very good; lees sound.

*April 29.* Bright and sound; racked.

*May 20.* Lees sound.

*June 12.* A bright wine, with strong but not very delicate bouquet; fine, full flavor and clean taste; general quality somewhat rough as yet, but very good.

*August 5.* The sediment is sound.

1891. *January 2.* A bright wine of a very good bouquet, and full characteristic flavor; general quality a good and well-matured wine.

*March 27.* Racked.

### *Discussion of Results.*

The first point to which we must call attention in the Verdot is the amount of its crop. Our experience has shown here, as well as in France, that the vine will be a fair, though somewhat inconstant bearer, if pruned long and placed in suitable locations. At the Cupertino Experimental Plot it yielded an enormous crop in 1886, as has been stated in the introductory paragraph, and since that time the largest crop was obtained in 1889, at the average of three and one third tons per acre, which amount, relative to its usual productiveness, must be considered a good crop. In 1888, from short-pruned vines, one and one seventh tons were obtained, while long-pruned vines gave just double the amount. From this it appears clear that, at least in one case for this grape, the method of pruning influenced the productiveness; it, however, did not influence the composition of the must, as will be seen hereafter.

The maximum of sugar contents, 28.33 per cent, was obtained in 1888 from both long and short-pruned vines, and the rate of acidity was very nearly the same, being .63 per cent in short-pruning, and .64 per cent in long-pruning. The only difference was shown by the ash percentage, which was .56 per cent for the short and .42 per cent for the long-pruned vines. The same result was not obtained in the grapes of 1887; the differences between short and long-pruning were rather pronounced, about 2 per cent more of sugar in favor of the former, and .1 per cent more of acidity in the latter.

Summarily glancing at the general results of the must analysis, we find the minimum of sugar and maximum of acidity in 1886, in the case of young vines, while in the following years the sugar contents varied from 24.64 to 28.33 per cent, and the rate of acidity from .63 to .85 per cent. A sample of this grape, sent from Natoma in 1884 to this laboratory, showed 23.04 per cent of sugar and .66 per cent of acids; but when picked at the proper time, we believe that the Verdot will contain about 26 per cent of sugar with adequate acidity, which would contribute to a sound and regular fermentation, and later to the keeping qualities of the wine.

As to alcoholic strength, this variety will give not less than 11.5 per cent of alcohol by volume in the wine, and an adequate or high acidity, varying from .44 to .71 per cent.

As to tannin, except in the case of the grapes from Natoma, 1884, and those from Cupertino (1886, from young vines), which was, respectively, .07 and .17 per cent, it has since varied from .23 to .338 per cent, making, therefore, quite an astringent wine.

As to color, this variety agrees very nearly with the Malbeck and

Cabernet Sauvignon, while it is about two and one half times higher than that of the Cabernet Franc, and nearly three times that of the Zinfandel.

The Verdot produces a heavy-bodied wine, which, being a good keeper, should be used in blending with grapes that, from several causes, do not always bring into the vat the necessary principles for making a good wine. The Malbeck is one of them, and in order to remedy its deficiency, its wine should be made by blending, in the proportion of four fifths of Malbeck and one fifth of Verdot, as is practiced in France and Italy, where they obtain a table wine of high quality, and which is much esteemed by the connoisseurs.

The Verdot, on account of its high degree of acidity, should also be used with the Cabernets, which generally have been found to contain little acid.

Finally, the Verdot, which does well in low grounds, and produces a good wine there, should be propagated in valley soils where other varieties would fail.

#### GROS MANSENC.

(*Synonyms:* Mansenc, Petit Mansenc, Grand Mansain, Mansain Tannat, Mancin.)

This variety is grown more or less in several localities of southwest France, and it is widely cultivated in the High Pyrenées region, where it is blended with the Tannat and the Bouchy in wine-making. It is very liable to the attacks of Oidium, and is therefore trained with horizontal canes or trellises. It may be trained low, but then it requires long-pruning in order to allow it to expend its natural strength. The characters of this variety are as follows: Leaves medium size, downy, slightly lobed; bunches average size, slightly shouldered, not very compact; berries medium size, round; skin of a reddish-black color, slightly pruinose at maturity, which occurs in the third period.

TABLE OF PRODUCTION.

| GROS MANSENC.                                                          | Number of Vines.. | Total Weight of Grapes, in lbs.... | Average per Vine, in lbs. .... | Date of Picking.... |
|------------------------------------------------------------------------|-------------------|------------------------------------|--------------------------------|---------------------|
| 1887—No. 730 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino  | 20                | 70                                 | 3.5                            | Oct. 13             |
| No. 747 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino       | 20                | 65                                 | 3.3                            | Oct. 17             |
| No. 747 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino      | 20                | 16                                 | .8                             | Oct. 17             |
| 1888—No. 878 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino | 20                | 66                                 | 3.3                            | Oct. 1              |
| No. 879 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino       | 19                | 154                                | 8.1                            | Oct. 1              |
| No. 931 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino       | 20                | 120                                | 6.0                            | Oct. 22             |
| 1889—No. 1144. J. T. Doyle, Experimental Plot, Cupertino.              | 19                | 80                                 | 4.2                            | Oct. 2              |



## COLOR READINGS.

| GROS MANSENG. | 1887.                                      |                | 1888.          |                | 1889.                                |
|---------------|--------------------------------------------|----------------|----------------|----------------|--------------------------------------|
|               | J. T. Doyle, Experimental Plot, Cupertino. |                |                |                | J. Gallegos,<br>Mission<br>San José. |
|               | No. 730<br>(long-pruned).                  | No. 747.       | No. 878.       | No. 931.       | No. 1140.                            |
| Must          | October 21.                                | October 27.    | October 8.     | 87             | October 8.                           |
| At pressing   | 98.0 1 V. R.                               | 100.0 2 V. R.  | 74.0 2 V. R.   | 83.3 2 V. R.   | 97.6 1 V. R.                         |
| One month     |                                            |                | 61.5 2 V. R.   | 50.0 1-2 V. R. |                                      |
| Two months    | 61.0 V. R.                                 | 66.6 2 V. R.   | 53.3 1-2 V. R. | 43.0 2 V. R.   | 52.6 1 V. R.                         |
| Three months  |                                            |                | 36.3 2 V. R.   | 37.7 2 V. R.   | 40.8 1 V. R.                         |
| Four months   | 14.6 5 V. R.                               | 63.5 2-3 V. R. | 34.8 2 V. R.   | 37.7 4 V. R.   | 36.0 1 V. R.                         |
| Five months   |                                            |                | 33.0 3 V. R.   |                | 33.7 1 V. R.                         |
| Six months    |                                            |                |                |                | 32.8 1 V. R.                         |
| Seven months  | 14.6 R.                                    | 40.0 4 V. R.   |                | 29.9 4 V. R.   |                                      |

*No. 730* (long-pruned). *Gros Mansenc*. From J. T. Doyle, University Plot, Cupertino. The grapes arrived October 14, 1887, and were crushed the same day. Their condition was good; stems rather dry, but berries sound. Compared with Pulliat's figure, the berries are small—"below medium"—and the bunches rather looser, but coulure accounts for that. Also the long peduncles and short pedicels are not so well pronounced in the figure as in our sample; but the taste agrees. Compared with Tannat, the berries are much alike, but the Tannat bunches are closer and more rigid, from a stronger peduncle; the Mansenc bunches are plainly pendulous. Some berries dried unripe, but none decayed, so the sample will make a good test. The juice showed 22.67 per cent of solid contents. Fermentation of 66.75 pounds crushed, began on the following day, reached its maximum of 79°, after a violent fermentation, on October 17th. It was drawn off on October 21st, seven days from crushing. The yield from the above amount was  $5\frac{1}{8}$  gallons, or at the rate of 152 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. December 16. Acetified. Racked and pasteurized the wine.

1888. February 8. Acid very sharp.

May 5. Bouquet hardly developed; a lightish body, excessive acid, and slightly acetous. Wine as a whole greatly inferior to No. 747.

June 16. Racked the wine and examined the sediment under the microscope; it still contains acetic and lactic germs; the former predominate.

*No. 747* (long and short-pruned). *Gros Mansenc*. From J. T. Doyle, University Plot, Cupertino. The grapes arrived October 18, 1887, and were crushed the following day. Their condition was only fair; much coulure, many berries half dried, and bunches rather small and scraggly, especially in the short-pruned; the latter show also rather more coulure. Still, the short-pruned is of distinctly sweeter taste than the long-pruned. The long and short-pruned samples were fermented together. The juice showed 24.91 per cent of solid contents. Fermentation of 75 pounds crushed began on October 20th, and reached its maximum of 87° on October 21st. The murk was drawn off on October 26th, eight days from crushing. The yield from the above amount was  $5\frac{1}{8}$  gallons, or at the rate of 138 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. December 20. Condition bright, with undeveloped bouquet, heavy body, high astringency, and medium acid. Whole wine is good, and of splendid promise.

1888. January 23. Racked the wine.

February 9. A clear wine, but slightly acetified. A microscopical examination of the sediment shows effete yeast, acetic and traces of lactic germs; racked and pasteurized the wine.

February 27. The wine has assumed a remarkable and delicate aroma, resembling a "sherry" flavor.

May 5. Acetic taste barely perceptible, bouquet only fairly developed, acid agreeable, and body heavy. Prospective quality very high.

June 18. Racked the wine again.

1889. November. Condition bright, with very dark color; a claret-like bouquet, neutral flavor, a taste not quite sound, good body, full acid and tannin, and medium alcohol; quality fair. Wine is improved in process by dilution.

*No. 878* (short-pruned). *Gros Mansenc*. From J. T. Doyle, Experimental Plot, Cupertino. Grapes arrived October 2, 1888, in excellent condition, and were crushed the same day. The juice showed 25.05 per cent of solid contents; early coulure from 5 to 25 per cent. Berries small and round, the stems green; bunches loose, very few with dried berries; coulure accounts for the uneven aspect of the bunches. Acid quite pronounced; sugar not high.

**No. 879** (long-pruned). Same description as for No. 878.

These two lots were combined and amounted to 178 pounds, and were fermented together, starting on October 3d, and reaching its maximum of 92.5° on October 5th. The murk was drawn off on October 8th. The yield from the above amount was  $13\frac{3}{8}$  gallons, corresponding to 153.1 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. November 28.** Taken to cellar.

**December 13.** Wine clear, almost bright, with undeveloped bouquet, high alcohol, and very high astringency; heavy body, and not unpleasant acid. The lees show traces of lactic germs; racked and pasteurized the wine.

**1889. February 27.** Racked; sediment shows dead lactic germs.

**August 3.** Condition bright; a good full wine, which stands dilution well. A small sample in demijohn shows a more marked bouquet.

**November 12.** Wine in keg; bouquet, which is claret-like, has improved, and wine generally developed since last tasting.

**1890. February 1.** The lees show no unsound germs; some effete alcoholic ferment.

**February 25.** Condition bright, with developed bouquet, fresh and agreeable flavor, astringency still too prominent; quality good; wine maturing well.

**March 3.** Racked.

**July 17.** Lees sound.

**July 23.** Well developed; a well-constituted wine of high quality, full flavored and clean tasting; mature.

**August 14.** Bottled.

**1891. February 12.** Wine bottled February 27, 1889, spoiled. Wine bottled March 3, 1890, bright, good bouquet, full flavor, and clean tasting. Wine bottled August 14, 1890, has less bouquet than preceding.

**No. 931. Gros Mansenc.** From J. T. Doyle, Cupertino. The grapes arrived October 23, 1888, in good condition, and were crushed the following morning; juice showed 24.21 per cent of solid contents. Bunches vary considerably in size, owing to their having been clipped before shipment, some few being of medium length and double-shouldered, stems green. Early coulure on some bunches as much as 8 per cent; late coulure not as bad as the early; many bunches contain dried or half-dried berries. Fermentation of 102 pounds crushed started October 25th, and reached its maximum of 90° the following afternoon. On October 29th the murk was drawn off. The yield from the above amount was  $7\frac{1}{2}$  gallons, corresponding to 152 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. December 10.** Lees show under the microscope a faint trace of lactic ferment. Racked and pasteurized the wine. Bouquet fairly developed, taste almost perfectly dry, but with indications of lactic taint; medium alcohol and high tannin.

**1889. January 12.** Nos. 878 and 931. "The former a little thin, the latter is best; both good wine." (E. W. H. and J. P.)

**February 27.** Sediment show lactic germs (probably dead), and some acetic germs.

**August 3.** In bright condition, with a red color tending to violet, undeveloped bouquet, a flavor disguised by acid, a harsh taste, too high acid, adequate astringency, and alcohol, quality not high; a dilution of 75 per cent improves the wine.

**1890. February 10.** Lees show much lactic ferment.

**February 15.** A good-colored, bright wine; lactic taint too pronounced to judge of the other qualities of the wine.

**No. 1140. Gros Mansenc.** From J. Gallegos, Mission San José. Grapes arrived October 4, 1889, and were crushed the same day; juice showed 23.40 per cent of solid contents. They were in good condition, and completely mature, bunches of good size, long and cylindrical, generally with one small shoulder, sometimes with two; grapes small and round. Fermentation commenced October 5th, and reached its maximum of 95° on October 6th. The murk was drawn off on October 7th, three days from crushing. The 119.5 pounds crushed gave 10.62 gallons, or at the rate of 177.8 gallons per ton.



RECORD OF TREATMENT AND TASTING.—1889. *November 25.* Wine still fermenting; threw out the bung.

*December 3.* Condition clear, with a dark, good tint; a rather burnt bouquet, neutral flavor, a little flattish taste, and full acid, astringency, and body; quality fair.

*December 7.* Racked, and taken to cellar.

1890. *January 23.* A bright wine of good claret-like and much improved bouquet, flavor, and general quality. Lees show lactic and much alcoholic germs.

*May 7.* Condition clear, taste good, but lactic acid perceptible; pasteurized the wine.

*June 3.* A little flat, otherwise very good; lactic taste almost gone.

*July 31.* Lees show dead lactic germs.

*August 19.* Bouquet improved; racked.

1891. *January 2.* Bright, some bouquet, and good color; smooth, and finished.

*March 17.* Wine bottled August 19, 1890, is spoiled; racked.

*August 16.* Bottled.

### *Discussion of Results.*

The above record shows that the Gros Mansenc is, in the first place, a good bearer when pruned long; in fact, the largest crop was obtained always from the long-pruned vines during the vintages of 1887, 1888, and 1889, at the Cupertino Experimental Plot. The saccharine strength varied from 21.80 per cent in young vines to 26 per cent, the largest amount being reached by the short-pruned vines.

In regard to acidity, this grape has shown itself to be a remarkable one, which recalls the Piedmontese grapes. The acidity in the Gros Mansenc varied from 1.01 to .52 per cent. The largest amount is in favor of the long-pruned vines, except in the cases of No. 931, long-pruned, where it was only .52 per cent, and No. 878, short-pruned, where it was .73 per cent, against .71 per cent in No. 879, long-pruned.

This variety, under ordinary conditions (and if not damaged by mildew), may produce a wine of fully 12 per cent of alcohol by volume, or even more.

Tannin has been observed in good proportion, even in the products from young vines, so that it can be relied on for a high astringency.

On the whole it makes a rather heavy-bodied wine, of good acidity, and of deep and persistent purplish-red color.

The wine has also shown itself to be a rather good keeper, and of a quality that places it among the best wines of the claret type.

Thus, on account of its good qualities, the Gros Mansenc should be widely cultivated in California, and in any case should be preferred to the Merlot, which, being so liable to damage by coulure and sunburn, gives a poor crop of only fair quality.

The strong acidity and color of the Mansenc is maintained even in the hot valleys, as will be noted in the samples from Fresno. This should be a strong recommendation for its culture in the southern portion of the State, when it is desired to make dry wines of the claret type.

### GAMAY TEINTURIER.

The Gamay Teinturier differs markedly from the Teinturier Mâle, with which it is sometimes confounded, on account of its colored juice. Like the Teinturier, the Gamay is but a moderate grower, and must be pruned long, but does not suffer as much from moderately short pruning as does the Teinturier. Its leaves have not the reddish tint shown by those of the Teinturier, though otherwise not dissimilar; the bunches differ markedly in being short cylindrical (like those of the Gamay), not triangular; rather smaller in size, but the berries larger, though still somewhat below the medium size. The canes never show the red

center so constant in the Teinturier. It is not therefore difficult to distinguish the two varieties, which in practice have frequently been confused. The distinction is important, for while the Teinturier Mâle can scarcely claim any practical value for California, the Gamay Teinturier commends itself, not only by reasonably good bearing, but also by the good quality and quick maturity of its wines. For blending purposes, it possesses nearly all the good qualities of the Teinturier, with few of its objectionable features. It deserves attention wherever the production of the claret type is naturally feasible, and desired by the producer. The grape has no special flavor, and can therefore enter into blends very generally without affecting the character of the bouquet noticeably, and certainly not injuriously; its good-keeping qualities also contrast favorably with the Teinturier.

TABLE OF PRODUCTION.

| GAMAY TEINTURIER.                                                           | Number of Vines... | Total Weight of Grapes, in lbs. .... | Average per Vine, in lbs. .... | Date of Picking.... |
|-----------------------------------------------------------------------------|--------------------|--------------------------------------|--------------------------------|---------------------|
|                                                                             |                    |                                      |                                |                     |
| 1887—No. 720 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino..... | 20                 | 70                                   | 3.5                            | Oct. 12             |
| No. 721 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino.....       | 20                 | 24                                   | 1.2                            | Oct. 12             |
| 1888—No. 835 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino..... | 40                 | 326                                  | 8.2                            | Sept. 12            |
| 1889—No. 1073 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino..... | 23                 | 280                                  | 12.2                           | Sept. 14            |

## ANALYSES OF WINES.

| GAMAY TEINTURIER.                                   | MUST.            |       |       |     | WINE. |                  |                       |                            |             |                        |        |                         |               |       |       |       |       |      |      |      |     |     |     |     |     |      |      |      |      |      |     |      |     |     |      |      |
|-----------------------------------------------------|------------------|-------|-------|-----|-------|------------------|-----------------------|----------------------------|-------------|------------------------|--------|-------------------------|---------------|-------|-------|-------|-------|------|------|------|-----|-----|-----|-----|-----|------|------|------|------|------|-----|------|-----|-----|------|------|
|                                                     | Date of Picking. |       |       |     | Ash   | Acid as Tartaric | Sugar by Copper Test. | Solid Contents by Spindle. | Alcohol.    |                        | Tannin | Total Acid as Tartaric. | Volatile Acid | Body  | Ash   |       |       |      |      |      |     |     |     |     |     |      |      |      |      |      |     |      |     |     |      |      |
|                                                     |                  |       |       |     |       |                  |                       |                            | By Weight   | By Volume              |        |                         |               |       |       |       |       |      |      |      |     |     |     |     |     |      |      |      |      |      |     |      |     |     |      |      |
|                                                     |                  |       |       |     |       |                  |                       |                            | At Pressing | At Six to Eight Months |        |                         |               |       |       |       |       |      |      |      |     |     |     |     |     |      |      |      |      |      |     |      |     |     |      |      |
| 1882—No. 137. H. W. Crabb, Oakville                 | Sept. 27         | 21.00 | 20.76 | .98 | 80    | 27.65            | 24.64                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1883—No. 138. J. H. Drummond, Glen Ellen            | Oct. 9           | 23.26 | 27.65 | .70 | 35    | 28.57            | 24.64                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1886—No. 507. J. T. Doyle, Cupertino                | Sept. 27         | 21.00 | 20.76 | .98 | 29    | 27.65            | 24.64                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1887—No. 720 (short-pruned). J. T. Doyle, Cupertino | Oct. 9           | 23.26 | 27.65 | .70 | 35    | 28.57            | 24.64                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1887—No. 721 (long-pruned). J. T. Doyle, Cupertino  | Oct. 9           | 23.26 | 27.65 | .70 | 35    | 28.57            | 24.64                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1888—No. 832. John Gallegos, Mission San José       | Sept. 9          | 24.67 | 24.64 | .69 | 43    | 24.67            | 24.64                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1888—No. 835. J. T. Doyle, Cupertino                | Sept. 12         | 22.11 | 21.80 | .93 | 38    | 22.11            | 21.80                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1889—No. 1058. John Gallegos, Mission San José      | Sept. 7          | 24.10 | 24.12 | .62 | 59    | 24.10            | 24.12                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1889—No. 1073. J. T. Doyle, Cupertino               | Sept. 14         | 22.60 | 22.67 | .82 | 35    | 22.60            | 22.67                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1890—No. 1228. Margherita Vineyard, Fresno          | Aug. 23          | 23.40 | 25.76 | .64 | 41    | 23.40            | 25.76                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1890—No. 1276. J. T. Doyle, Cupertino               | Sept. 30         | 21.93 | 25.76 | .80 | 23    | 21.93            | 25.76                 | 22.11                      | 21.80       | 24.10                  | 22.60  | 22.67                   | 25.76         | 23.40 | 21.93 | 24.00 | 25.29 | 2.31 | 2.56 | 2.41 | .72 | .90 | .50 | .56 | .09 | 3.10 | 3.10 | 2.85 | 2.65 | 3.07 | .56 | .202 | .84 | .52 | 2.58 | 3.08 |
| 1890—No. 1294. John Gallegos, Mission San José      | Oct. 1           | 24.00 |       | .84 | 23    |                  |                       |                            |             |                        |        |                         |               |       |       |       |       |      |      |      |     |     |     |     |     |      |      |      |      |      |     |      |     |     |      |      |

## COLOR READINGS.

| GAMAY TEINTURIER.                                                                                                                                     | 1886.                     | 1887.                      |                           |           | 1888.     |           | 1889.     |         |         |         |              |      |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------|---------------------------|-----------|-----------|-----------|-----------|---------|---------|---------|--------------|------|-----------|
|                                                                                                                                                       | John T. Boyle, Cupertino. |                            |                           |           |           |           |           |         |         |         |              |      |           |
|                                                                                                                                                       | No. 507.                  | No. 720<br>(short-pruned). | No. 721<br>(long-pruned). | No. 835.  | No. 832.  | No. 1058. | No. 1073. |         |         |         |              |      |           |
| Must.<br>At pressing {<br>One month.<br>Two months.<br>Three months.<br>Four months.<br>Five months.<br>Six months.<br>Seven months.<br>Eight months. | Oct. 6.                   | 24.6                       | R.                        | 21.0      | 5 V. R.   | 9.5       | 3 R.      | 15.1    | 3 R.    | 14.9    | V. R. + 1 Y. | 17.6 | 2 R.      |
|                                                                                                                                                       | 54.1                      | 2 V. R.                    | Oct. 25.                  | 60.0      | 2 V. R.   | 66.6      | 3 V. R.   | 60.6    | 3 V. R. | 102.6   | Sept. 17.    | 67.8 | Sept. 23. |
|                                                                                                                                                       | 53.3                      | 2 V. R.                    | No wine made.             | 44.4      | 1-2 V. R. | 57.1      | 2-3 V. R. | 40.0    | 4 V. R. | 59.1    | 2 V. R.      | 21.0 | 2 V. R.   |
|                                                                                                                                                       | 47.2                      | 2 V. R.                    | No wine made.             | 44.4      | 1-2 V. R. | 65.6      | 3 V. R.   | 36.4    | 4 V. R. | 51.2    | 4-5 V. R.    | 21.0 | 2 V. R.   |
|                                                                                                                                                       | Four months.              | No wine made.              | 20.0                      | 4-5 V. R. | 57.1      | 3 V. R.   | 26.6      | 5 V. R. | 51.2    | 4 V. R. | 3 V. R.      | 22.2 | 2 V. R.   |
|                                                                                                                                                       | Five months.              | No wine made.              | 20.0                      | 4-5 V. R. | 50.6      | 2 V. R.   | 22.2      | 1 R.    | 40.0    | 3 V. R. | 2 V. R.      | 21.6 | 2 R.      |
|                                                                                                                                                       | Six months.               | No wine made.              | 16.9                      | 1 R.      | 50.0      | 3 V. R.   | 22.2      | 1 R.    | 39.2    | 3 V. R. | 3 V. R.      | 21.6 | 3 V. R.   |
|                                                                                                                                                       | Seven months.             | No wine made.              | 16.9                      | 1 R.      | 50.0      | 3 V. R.   | 22.2      | 1 R.    | 39.2    | 3 V. R. | 3 V. R.      | 21.6 | 3 V. R.   |
|                                                                                                                                                       | Eight months.             | No wine made.              | 16.9                      | 1 R.      | 50.0      | 3 V. R.   | 22.2      | 1 R.    | 39.2    | 3 V. R. | 3 V. R.      | 21.6 | 3 V. R.   |
|                                                                                                                                                       | Eight months.             | No wine made.              | 16.9                      | 1 R.      | 50.0      | 3 V. R.   | 22.2      | 1 R.    | 39.2    | 3 V. R. | 3 V. R.      | 21.6 | 3 V. R.   |

No. 720 (short-pruned). *Gamay Teinturier*. From J. T. Doyle, University Plot, Cupertino. The grapes arrived October 12, 1887, in an overripe condition, many berries half dried. Bunches quite small for the variety, short, stumpy. A good deal of late coulure, *i. e.*, small dried-up berries. The juice showed 26.26 per cent of solid contents; acid, .80 per cent. Only a few pounds of the grapes were received, so no wine was made.

No. 721 (long-pruned). *Gamay Teinturier*. From J. T. Doyle, University Plot, Cupertino. The grapes arrived October 12, 1887, and were crushed the following day. Their condition was good, some berries shriveled. Bunches much larger than those of No. 720, less dried-up, and less couled. Cylindrical bunches, characteristically developed; berries quite large, like first crop Zinfandel; juice well colored, but not as deep as Teinturier Mâle. The juice showed 26.57 per cent of solid contents. Fermentation of 69.75 pounds crushed reached its maximum of 78° on October 16th, and remained at that point for twenty-four hours. It was drawn off on October 25th, twelve days from crushing. The yield from above amount was  $5\frac{3}{8}$  gallons, or at the rate of 152 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. December 16. A good, sound, clean-tasting wine of decidedly developed bouquet.

1888. February 5. Racked the wine from the lees.

February 8. A bright, smooth, well-proportioned wine, with a fruity flavor, heavy body, and pleasant acid.

May 24. The sediment shows under the microscope traces of lactic germs; racked and pasteurized the wine for safety.

June 16. Condition bright, with a well-developed and fruity bouquet; medium acid, high astringency, but not roughish or bitter.

1889. November. (Sample in keg.) Condition bright, with good color; a bouquet somewhat impaired by acetification; an agreeable flavor, medium body and alcohol, high acid, full astringency, and fair quality. Sample in bottle differs from the sample in keg by having a marked and pleasing bouquet, clean and well-developed taste, less acid, and very good quality.

No. 832. *Gamay Teinturier*. From J. Gallegos, Mission San José. Grapes arrived September 12, 1888, and were crushed the same day. Juice showed 24.67 per cent of solid contents. Fermentation of 40 pounds crushed began on September 15th, and reached its maximum of 85° the following afternoon. On October 19th the murk was drawn off. The yield from the above amount was  $3\frac{1}{4}$  gallons, corresponding to 162½ gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. October 29. Racked and taken to cellar.

December 11. Lees showed no unsound germs, but the wine was pasteurized for safety; bouquet very well developed, acid and astringency medium and pleasant; body, alcohol, and quality high.

1889. February 28. Racked again; sediment shows no unsound germs.

August 2. Condition bright, with a good dark tint, and a bouquet less satisfactory; only a fair flavor and taste; too high acid, with medium astringency and alcoholic strength; quality not very good; stands dilution fairly well.

1890. February 1. Lees show some lactic germs.

February 13. A clear wine, but has a somewhat lactic taint.

March 13. Racked.

1891. January 31. Wine full of bad acids; but is, however, bright and well colored.

No. 835. *Gamay Teinturier*. From J. T. Doyle, Experimental Plot, Cupertino. Grapes arrived September 13, 1888, in good condition, and were crushed the same day. Juice showed 22.11 per cent solid contents. Bunches, part compact, others loose from coulure; stems green; berries full and round, some a little flabby; nearly all the bunches show effects of coulure, containing small berries. On the

whole the grapes are full ripe. In some bunches the berries are fully double the size of others. Fermentation of 201 pounds crushed began on September 16th, and reached its maximum of 92.5° the next morning. On October 19th the murk was drawn off. The yield from the above amount was 16½ gallons, corresponding to 164.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Action ceased; taken to cellar.

*December 12.* Racked; lees upon examination show no unsound germs. Condition clear, with well-developed bouquet, vinous flavor, heavy body, good and full acid, astringency, and alcohol. A good wine for blending.

1889. *January 12.* "A wine of fine color, but quality not very high; makes an excellent blend with Robin Noir." (E. W. H. and F. P.)

*March 18.* Lactic germs found in small amount in the sediment; pasteurized the wine.

*May 16.* Racked; clear condition.

*August 2.* Condition bright, with a good red color, less deep than No. 832. A marked bouquet, agreeable flavor and taste, good body; acid, astringency, and alcoholic strength in due proportion; quality good; stands well a dilution of 100 per cent.

*November 12.* Color rather light and agrees with last tasting; wine perfectly sound. Wine in half bottle in good order, but has a deeper color than the keg sample.

1890. *February 1.* Lees show some bitter ferment.

*February 26.* Condition bright, bouquet marked, flavor vinous, acid and tannin good, quality good.

*February 27.* Racked.

*March 10.* Racked again; some wine bottled.

*July 20.* Lees sound. The wine bright, with light bouquet and good flavor, clean taste, full astringency; general quality fresh and good.

*August 11.* Some more wine bottled.

1891. *February 2.* Wine bottled for fifteen months bright, good bouquet, and full flavor, high acid and astringency. Wine bottled for twenty-one months is about as the above, but rather smoother, with less flavor, and more yellowish color; general quality of both good.

*No. 1058. Gamay Teinturier.* From J. Gallegos, Mission San José. The grapes arrived September 12, 1889, in very moldy condition. After carefully picking over, about one fifth was rejected; the rest was crushed the same day. Juice showed 24.1 per cent of solid contents. Fermentation attained its maximum of 97° on September 16th. The murk was drawn off on September 17th, five days from crushing, being nearly dry. From 173.5 pounds crushed 11.75 gallons were obtained, corresponding to 135.5 gallons per ton.

RECORD OF TREATMENT AND TASTING. 1889. *October 14.* Condition quite clear, some bouquet, high acid, agreeable taste, dark color, but not very intense.

*November 11.* Racked and taken to cellar.

1890. *January 27.* Condition bright, with dark color, a good tint, marked and pleasant bouquet, clean but roughish taste, full acid; medium astringency, body, and alcohol; quality good; lees sound.

*May 2.* Bright and sound wine; racked.

*May 16.* Lees still sound.

*June 1.* A bright and very good wine, not tasting of the moldy grapes.

*July 31.* Lees sound.

1891. *January 1.* Lees show much "*pastorianus*" ferment.

*January 2.* The wine has become more mature, but is otherwise unchanged since last tasting.

*March 16.* Racked the wine. The sample in bottle is good, but rougher and less developed than that in keg, and still has a little moldy odor.

*No. 1073. Gamay Teinturier.* From J. J. Doyle, Cupertino. Arrived September 17, 1889, slightly moldy, and generally in bad condition; maturity complete. Crushed the following day; juice showed 22.6 per cent of solid contents. Fermentation reached its maximum of 92° on September 22d, very little being formed. The murk was drawn off five days from crushing, being quite dry.

RECORD OF TREATMENT AND TASTING.—1889. *November 7.* Clear, with undeveloped bouquet, high acid, full astringency; still tastes very rough.

*November 22.* Racked and taken to cellar.

1890. *January 14.* Strong but somewhat coarse bouquet, and a flavor somewhat moldy, but otherwise sound.

*January 15.* Lees still show an abundance of alcoholic ferment.

*May 2.* Condition bright; wine still quite rough but sound. Racked.

*May 16.* Lees sound.

*June 9.* A bright wine of good color and bouquet; its flavor is much improved; general quality good, but backward in development.

*July 31.* Lees show a good deal of "*pastorianus*" ferment.

*December 30.* Lees from 2-gallon keg show lactic ferment.

1891. *January 1.* The sediment from large keg contains much "*pastorianus*" but no lactic ferment. The wine is bright, has not much bouquet, but good flavor, except for a slight moldy taste; full acid and astringency; quality good, but not quite mature.

*March 25.* Wine racked, and partly bottled.

### *Discussion of Results.*

It will be noted that the table of production, as far as it goes, shows markedly better bearing for the Gamay Teinturier than for the Teinturier Mâle in the same seasons. The effects of short, as against long-pruning, are marked, but less so than in the Teinturier. The average production of ten pounds per five-year-old vines in the years 1888 and 1889, forms a fair gauge of what may be expected of the Gamay. In saccharine strength it is a little behind the Teinturier; in acid generally somewhat higher, both in wine and must, but doubtless from that very cause it quickly develops an agreeable bouquet, which renders it salable quite early in its development. Its tannin contents keep pace with the acid, and render it suitable for the "claret" type of wines. Its body or extract seems, on the whole, to be somewhat less than that of the Teinturier, but still quite high. In depth and stability of color the Gamay is nearly equal to the Teinturier.

On the whole, then, the Gamay Teinturier must be classed among the varieties which, while hardly to be recommended for the production of ordinary wines, are worthy of trial for the production of special wines in certain localities, where, from any cause, other varieties do not yield satisfactory results, and especially too little color. It, however, requires long, or at least half-long pruning.

### TEINTURIER MÂLE.

The Teinturier Mâle, as its name indicates, is cultivated especially for its color, and used in blend with wines lightly colored. Its relatively light bearing, the smallness of its compact, triangular bunches, and liability to coulure both early and late, render it somewhat uncertain in its value to California. It is easily recognized by its dark reddish leaves, and by the reddish center around the pith of any strong, mature cane. The leaves turn a dark crimson color earlier than any other variety. The berries, below medium size, have a strongly colored juice, of rather red than violet tint; the skin is rather thin. It is only a moderate bearer, and must be pruned at least half-long, in order to obtain a reasonable crop. It matures early.

TABLE OF PRODUCTION.

| TEINTURIER MÂLE.                                                              | Number of Vines.. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs. .... | Date of Picking... |
|-------------------------------------------------------------------------------|-------------------|---------------------------------------|-----------------------------------|--------------------|
|                                                                               |                   |                                       |                                   |                    |
| 1887—No. 722 (long-pruned). J. T. Doyle, Experimental<br>Plot, Cupertino..... | 20                | 28                                    | 1.4                               | Oct. 11            |
| No. 723 (short-pruned). J. T. Doyle, Experimental<br>Plot, Cupertino.....     | 20                | 15                                    | .8                                | Oct. 11            |
| 1888—No. 836 (long-pruned). J. T. Doyle, Experimental<br>Plot, Cupertino..... | 40                | 315                                   | 7.9                               | Sept. 12           |
| 1890—No. 1283. J. T. Doyle, Cupertino.....                                    | 20                | 245                                   | 12.2                              | Oct. 1             |



## ANALYSES OF WINES.

| TEINTURER MÂLE.                                    | Date of Picking | MUST.                     |                        |                  |     | WINE.    |        |                         |           |      |     |       |             |
|----------------------------------------------------|-----------------|---------------------------|------------------------|------------------|-----|----------|--------|-------------------------|-----------|------|-----|-------|-------------|
|                                                    |                 | Solid Contents by Spindle | Sugar by Copper Test.. | Acid at Tartaric | Ash | Alcohol. | Tannin | Total Acid as Tartaric. |           | Body | Ash | Sugar |             |
|                                                    |                 |                           |                        |                  |     |          |        | By Weight               | By Volume |      |     |       |             |
|                                                    |                 |                           |                        |                  |     |          |        |                         |           |      |     |       | At Pressing |
| 1885—No. 370. D. C. Feely, Patchen                 | Oct. 27         | 20.78                     | ---                    | 94               | .34 | 8.06     | 180    | .56                     | 3.07      |      |     |       |             |
| 1886—No. 492. J. T. Doyle, Cupertino               | Sept. 21        | 20.90                     | 20.86                  | 65               | .37 | *8.34    | 114    | .75                     |           |      |     |       |             |
|                                                    |                 |                           |                        |                  |     | +8.34    | 280    |                         |           |      |     |       |             |
|                                                    |                 |                           |                        |                  |     | +9.85    | 11.82  |                         |           |      |     |       |             |
| No. 542. D. C. Feely, Patchen                      | Oct. 19         | 24.30                     | 24.64                  | 75               | .39 | +9.49    | 13.18  | .54                     | 2.82      |      |     |       |             |
|                                                    |                 |                           |                        |                  |     | +10.72   |        | .61                     | 3.30      |      |     |       |             |
| 1887—No. 722 (long-pruned), J. T. Doyle, Cupertino | Oct. 11         | 25.70                     | 25.07                  | 67               | .40 | 9.92     | 380    | No wine.                |           |      |     |       |             |
| No. 723 (short-pruned), J. T. Doyle, Cupertino     | Oct. 11         | 26.66                     | ---                    | 78               |     |          |        |                         |           |      |     |       |             |
| 1888—No. 833. J. Gallegos, Mission San José        | Sept. 9         | 25.19                     | 25.19                  | 62               | .60 | 9.92     | 290    | .51                     | 3.60      |      |     |       |             |
| No. 836. J. T. Doyle, Cupertino                    | Sept. 12        | 23.36                     | 23.62                  | 56               | .40 | 9.34     | 335    | .53                     | 2.95      |      |     |       |             |
| 1889—No. 1051. Margherita Vineyard, Fresno         | Sept. 2         | 30.20                     | 30.30                  | 42               | .81 | 15.17    | 159    | .61                     | 3.45      |      |     |       |             |
| No. 1067. J. Gallegos, Mission San José            | Sept. 7         | 23.70                     | 24.12                  | 41               | .40 | 9.70     | 299    | .63                     | 3.20      |      |     |       |             |
| 1890—No. 1263. J. Gallegos, Mission San José       | Sept. 25        | 24.00                     | ---                    | 47               | .36 |          |        | .55                     |           |      |     |       |             |
| No. 1292. J. Gallegos, Mission San José            | Oct. 1          | 23.60                     | ---                    | 80               | .21 | 9.34     | 310    | .37                     | 2.78      |      |     |       |             |
| No. 1205. Margherita Vineyard, Fresno              | Aug. 12         | 24.55                     | 24.43                  | 48               | .54 | 9.34     | 210    | .46                     | 3.20      |      |     |       |             |
| No. 1283. J. T. Doyle, Cupertino                   | Oct. 1          | 25.20                     | ---                    | 70               | .32 | 9.92     | 359    | .54                     | 3.28      |      |     |       |             |

|    | * December, 1886. | † June, 1887. | ‡ Fortified. |
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## COLOR READINGS.

|                     | 1886.                                      |                                           | 1887.                     |                         | 1888.                                             |                                            | 1889.                        |                                |
|---------------------|--------------------------------------------|-------------------------------------------|---------------------------|-------------------------|---------------------------------------------------|--------------------------------------------|------------------------------|--------------------------------|
|                     | J. T. Doyle, Experimental Plot, Cupertino. | D. C. Feely, Patchen, Santa Clara County. | John T. Doyle, Cupertino. |                         | J. Gallegos, Experimental Plot, Mission San José. | J. T. Doyle, Experimental Plot, Cupertino. | Margherita Vineyard, Fresno. | J. Gallegos, Mission San José. |
|                     | No. 492.                                   | No. 542.                                  | No. 722 (long-pruned).    | No. 723 (short-pruned). | No. 833.                                          | No. 836.                                   | No. 1051.                    | No. 1067.                      |
| Must                | October 1.                                 | 33.3 R. October 26.                       | 43.0 3 V. R. October 20.  | 72.7 4 V. R.            | 44.4 4 V. R. Sept. 19.                            | 28.5 5 V. R. Sept. 19.                     | Sept. 13.                    | 24.3 R. +1 Y. Sept. 16.        |
| At pressing { Date. | 44.4 2 V. R.                               | 75.2 2 V. R.                              | 100.0 2-3 V. R.           | 72.7 4 V. R.            | 66.6 1 V. R.                                      | 60.6 4 V. R.                               | 24.7 1 R.                    | 86.9 4 V. R.                   |
| One month           | 44.4 2 V. R.                               | 75.2 2 V. R.                              | 66.6 V. R.                | 72.7 4 V. R.            | 44.4 5 V. R.                                      | 47.6 2-3 V. R.                             | 22.3 1 R.                    | 86.9 4 V. R.                   |
| Two months          | 43.0 2 V. R.                               | 75.2 2 V. R.                              | 66.6 V. R.                | 72.7 4 V. R.            | 71.4 3 V. R.                                      | 53.0 2 V. R.                               | 17.0 3 R. +1 Y.              | 40.8 3 V. R.                   |
| Three months        |                                            |                                           | 66.6 V. R.                | 72.7 4 V. R.            | 53.3 4 V. R.                                      | 53.0 2 V. R.                               | 11.9 3 R. +2 Y.              |                                |
| Four months         |                                            |                                           | 66.6 1 V. R.              | 72.7 4 V. R.            | 50.0 4 V. R.                                      | 38.1 2 V. R.                               |                              |                                |
| Five months         | 42.1 3 V. R.                               | 66.6 2 V. R.                              | 40.0 2 V. R.              | 72.7 4 V. R.            | 44.4 4 V. R.                                      | 38.8 3 V. R.                               |                              |                                |
| Six months          |                                            |                                           |                           | 72.7 4 V. R.            |                                                   |                                            |                              |                                |
| Seven months        |                                            |                                           |                           | 72.7 4 V. R.            |                                                   |                                            |                              |                                |
| Eight months        |                                            |                                           |                           | 72.7 4 V. R.            |                                                   |                                            |                              |                                |

*No. 722* (long-pruned). *Teinturier Mâle*. From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 12, 1887, and were worked the following day. Their condition was good, but somewhat overripe; some berries, especially of the smaller buckshot size, injured from early coulure quite 40 per cent. Berries very sweet, yet acid. The juice showed 25.70 per cent of solid contents. Fermentation of 35 pounds crushed reached its maximum of 78° on the evening of October 15th. It was drawn off on October 20th, seven days from crushing. The yield from the above amount was 2½ gallons, or at the rate of 143 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 16*. A capital wine, clean-tasting, heavy-bodied, pronounced astringency, and pleasant; rapidly advancing bouquet.

1888. *January 25*. Racked the wine from the lees.

*February 16*. (In glass.) Bright condition, high astringency; taste, a little sweet. A pleasant wine on the whole.

*June 2*. Condition bright, with excellent bouquet; high astringency, and, to a certain extent, covering the acid; alcoholic odor, and heavy body; acid prominent in after-taste. A microscopical examination of the sediment shows considerable lactic ferment and effete yeast; the wine was therefore racked and pasteurized.

*No. 723* (short-pruned). *Teinturier Mâle*. From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 13, 1887, in a rather poor condition. Late coulure excessive, perhaps 60 per cent of buckshot size and smaller berries. Bunches quite small, fully 30 per cent smaller than those of the long-pruned. Sound berries very large. The juice showed 26.66 per cent of solid contents; acid, .78 per cent. Only a small lot being received no wine was made.

This experiment shows very strikingly the ill effects of short-pruning on this variety, and explains the unsatisfactory results reported by growers who have tried it on that place.

*No. 833. Teinturier Mâle*. From J. Gallegos, Mission San José. Grapes arrived in good condition September 12, 1888, and were crushed the following day, juice showing 25.19 per cent of solid contents. Fermentation of 17.5 pounds crushed reached its maximum of 87° on the morning of September 17th, when it seemed inclined to "get stuck," and was placed in a warm room until September 19th, when the murk was drawn off, six days from crushing. The yield from the above amount was 1½ gallons, corresponding to 142.8 gallons per ton.

RECORD OF TREATMENT AND TASTING.—After remaining in the room for after-fermentation (kept at 70°) until November 15th, the wine was transferred to the cellar (tem. 60°).

On *December 13* the wine showed a well-developed bouquet, a medium acid, full astringency, heavy body, and deep color; an excellent wine for blending purposes.

1889. *April 3*. The wine in racking was found to be somewhat turbid and materially increased in acidity, and evolving some gas.

*April 5*. Pasteurized.

*August 9*. The wine was found to be dark red and in bright condition, but its bouquet gone, and replaced by the odor of milk-sourness.

*November 5*. As its condition did not improve, it was distilled.

*No. 836. Teinturier Mâle*. From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived and were worked on September 13, 1888. They were in good condition, and the juice showed 22.36 per cent of solid contents. By mistake the long and short-pruned grapes were mixed. On many bunches the coulure amounted to nearly 50 per cent; berries small, due perhaps to late coulure; very uneven in size. Fermentation of 200 pounds crushed began on September 15th, and reached its maximum of 89° on September 16th. The murk was drawn

off on September 19th, six days from crushing, yielding from the above amount 16 gallons, or at the rate of 160 gallons per ton.

**RECORD OF TREATMENT AND TASTING.**—1889. *January 3.* Racked; contained much carbonic acid gas, and was not clear.

*January 13.* Taken to cellar.

*March 12.* Pasteurized.

*May 16.* Racked again; condition clear, but wine does not taste clean.

*August 9.* The wine in a bright condition, with good, dark-red color; small bouquet, and rather good flavor. The taste is clean, with good body and quality, full acid and tannin, and medium alcohol; on dilution holds its qualities well.

*1890. February 1.* Lees show a considerable amount of lactic germs.

*February 15.* (In five-gallon keg.) Condition bright, with good color, poor bouquet, rather good flavor, but with a slight lactic taint.

*February 18.* (In eight-gallon keg.) Lactic flavor very slightly perceptible, but much better than that of the five-gallon package; quality good, and on the whole, superior to the latter. Both kegs racked.

*April 24.* The wine was submitted one half hour to electrical treatment.

*July 15.* Lees sound.

*July 24.* A clear and fair wine; deteriorated since last tasting; it has not good bouquet.

*August 15.* Some of the wine was bottled.

*1891. February 2.* Wine bright, with good color, no bouquet, slight acetic smell, and of fair quality.

**No. 1051. *Teinturier Mâle.*** From Margherita Vineyard, Fresno. A small sample of grapes arrived September 5, 1889, and was crushed the following day, juice showing 30.2 per cent of solid contents. Their condition was overripe and partly dried. The juice was not as red as usually is the *Teinturier Mâle*, and the leaves inclosed were green and more like the *Gamay Teinturier*. The fermentation of a few pounds for color experiment started September 7th, and attained its maximum of 75° on September 8th. On September 12th the murk was drawn off, five and a half days from crushing, still being very sweet, and showing 13 per cent of solid contents. Only three fourths of a gallon was made.

**RECORD OF TREATMENT AND TASTING.**—1889. *October 18.* Taste sound, with a strong port-wine flavor, very nearly dry. Racked and added one sixth of a pint of alcohol, of 75 per cent strength, to five pints of the original wine.

*1890. January 6.* Condition bright, with a dark-orange tint, and a bouquet and flavor very strongly of a port character; a slightly bitter taste, full astringency, low acid, and a very small amount of sugar; quality only fair.

*January 15.* Racked and blended with No. 1055 in proportion of two of No. 1051 to five of No. 1055.

*January 14.* Placed in the hot-box. (Temperature 90° to 95°.)

*April 14.* Removed from the hot-box.

*June 15.* Racked the wine; its condition is clear, with very little color; a very pronounced but coarse bouquet and flavor, and an astringency too high; quality fair.

*November 15.* Not improved very much; somewhat too acid.

*1891. January 26.* Wine coarse and biting.

**No. 1076. *Teinturier Mâle.*** From John Gallegos, Experimental Plot, Mission San José. Grapes arrived September 12, 1889, and were crushed the same day; the juice showed 23.7 per cent of solid contents; they were in bad condition, partly moldy and commencing to dry up; on sorting over half was rejected. Fermentation reached its maximum of 88.5° on September 15th. The murk was drawn off on September 16th, four days from crushing, being nearly dry. From 25.5 pounds crushed, 2.06 gallons of wine were obtained, corresponding to 161.7 gallons per ton.

**RECORD OF TREATMENT AND TASTING.**—1889. *October 14.* The wine is in clear condition, with full acid and astringency, and very deep color. Racked November 2d, and put in glass on account of smallness of sample.

*1890. January 27.* Wine evidently out of condition, the cork being lifted when loosened. Flavor flat and slightly bitter, but alcohol, acid, and tannin full and apparently normal. In the lees were found the characteristic forms of the "bitter ferment."

*March 25.* The wine was pasteurized.

*June 3.* Condition is bright, with a "burnt" taste and an improved flavor and bouquet, but still of very poor quality.

*July 14.* Racked the wine, which was still poor in quality.

*1891. March 25.* The wine not having improved at all, it was distilled at date.

### *Discussion of Results.*

In glancing at the above records the Teinturier Mâle appears at first to be a light and uncertain bearer, much liable to coulure, especially if pruned short; and that the grapes are very liable to damage from moist weather at the vintage time. However, the grapes attain 25 per cent. and sometimes more, of sugar, and produce a heavy-bodied wine of rather strong astringency with a good proportion of acidity, so it dilutes well, and is therefore much adapted to blends in claret wines. Its color is deep and quite stable, therefore very valuable for heightening the color of other wines; but in the warm climate of Fresno, as our observation shows, it loses even this quality. In conclusion, this variety cannot be recommended for general planting, for there are other varieties less delicate and better bearers, which can usefully fulfill the purposes for which the Teinturier is principally used. We know that in southern France it is about to be abandoned and largely replaced by the Portuguais Bleu, which has shown itself to be a very good bearer, producing a good quality of deep-colored wine, which is also well adapted for blending purposes.

### CHARBONO.

The Charbono, also known as Corbeau, is too well known to need description; and while its heavy and regular bearing rendered it a favorite in the early days of viticulture, its popularity has declined so far at this time that, with the exception of a few localities, it has very largely been grafted out. Its peculiar rankness is especially pronounced in valley locations; but in the Santa Cruz Mountains and even at Cupertino, it yields wine of very fair quality, esteemed on account of its deep tint, which makes it useful in bringing up the color of light-tinted red wines of the lower grades.



## COLOR READINGS.

| CARBONO.           | 1886.                     |                          | 1887.                      |
|--------------------|---------------------------|--------------------------|----------------------------|
|                    | H. P. Gregory,<br>Soquel. | D. C. Feely,<br>Patchen. | J. P. Smith,<br>Livermore. |
|                    | No. 528.                  | No. 537.                 | No. 689.                   |
| Must               | Rose.                     | Rose.                    |                            |
| At pressing { Date | October 25.               | October 27.              | October 1.                 |
| { Color            | 45.9 1 V. R.              | 33.8 2 V. R.             | 40.0 1 V. R.               |
| One month          | 43.0 1 V. R.              | 30.1 2 V. R.             |                            |
| Two months         | 37.0 2 V. R.              | 25.1 2 V. R.             | 22.2 1-2 V. R.             |
| Four months        | 40.0 2 V. R.              | 18.8 2 V. R.             | 21.0 2 V. R.               |
| Six months         | 27.7 3 V. R.              | 18.0 2 V. R.             |                            |
| Seven months       |                           |                          | 16.8 5 V. R.               |
| Eight months       | 20.0 4 V. R.              | 15.0 4 V. R.             |                            |

*No. 689. Charbono.* From J. P. Smith, Livermore. The grapes arrived September 26, 1887, and were worked the same day. Bunches very characteristic, compact, almost no coulure, a few dried berries; seem to have suffered least in transportation of any of the varieties sent. The juice showed 21.43 per cent of solid contents. Fermentation of 78 pounds crushed began promptly, and reached its maximum of 80° on the 29th, fermenting slowly without any violent action. It was drawn off on October 1st, five days from crushing. The yield was at the rate of 154 gallons per ton.

The wine cleared rapidly, but developed slowly, and did not attain a satisfactory quality, although keeping well. It was low in acid, with thin body and high astringency, and while comparatively free from the peculiar rankness of the variety, did not acquire a pronounced bouquet.

*Discussion of the Tabulated Results.*

As regards the *sugar contents* of the Charbono musts, the table shows that it inclines to be quite low, remaining below 20 per cent in eight out of nine cases on record.

The *acidity* of the musts varies greatly, from .53 to as much as .83; but on the whole it is well known to be generally adequate in this variety.

The *alcoholic contents* of the wines are of course correspondingly low; for the wines made at the laboratory, they range from 8 to 9.75 per cent; while in those sent for examination the range is from 10 to as much as 12.91 per cent.

In *tannin* the wines of the Santa Cruz Range are distinctly the highest, as much as .25 per cent being on record for the wine from Soquel, and about .20 per cent from Cupertino, Glenwood, and Livermore; the rest ranging as low as .11 in two cases. The Charbono is thus not among the highly tannic wines.

The *acid* is, on the whole, not high for a wine so low in alcohol, and is never excessive, provided the grape be mature.

The *body* of the Charbono wine is generally low for a red wine, reaching 3 per cent and a little over only in two cases (Cupertino and Livermore) out of fourteen, while the wines from Patchen and from Oakville

actually fall below 2 per cent, the rest remaining between 2 and 3 per cent.

In the *ash-percentage* there is nothing unusual.

The *color* table shows that while the tint of normal Charbono wines ranges above 40 at pressing, it loses slowly in the course of time, coming down to somewhat less than half in the course of eight months. This is a very fair showing for steadiness of color, and justifies the reputation of the grape in this respect.

**AFFENTHALER. (AFFENTHALER SÄUERLICHER.)**

Ampelographers do not agree as regards the synonymy of this variety. Some authors think that it is identical with the Black Pinot; some others with other varieties. Its typical characters are the following: Leaves medium size, light green and with small black dots on the upper surface, while the lower surface is downy and grayish green, with yellow dots. Bunches medium size, but somewhat long and much branched. Berries medium size, bluish black, sweet, but somewhat acid.



| ANALYSES OF WINES. | AFFENTHALER.                    | MUST.                          |       |       |     | WINE.                       |     |      |  |
|--------------------|---------------------------------|--------------------------------|-------|-------|-----|-----------------------------|-----|------|--|
|                    |                                 | Date of Picking.....           |       |       |     | Total Acid as Tartaric.     |     |      |  |
|                    |                                 | Ash .....                      |       |       |     | At Six to Eight Months..... |     |      |  |
|                    |                                 | Acid as Tartaric.....          |       |       |     | At Pressing .....           |     |      |  |
|                    |                                 | Sugar by Copper Test..         |       |       |     | Tannin.....                 |     |      |  |
|                    |                                 | Solid Contents by Spindle..... |       |       |     | Alcohol.                    |     |      |  |
|                    |                                 |                                |       |       |     | By Volume.....              |     |      |  |
|                    |                                 |                                |       |       |     | By Weight .....             |     |      |  |
| 1889—No. 1093.     | John Gallegos, Mission San José | Sept. 16                       | 23.60 | 23.62 | .27 | No wine.                    |     |      |  |
| No. 1153.          | J. T. Doyle, Cupertino          | Oct. 8                         | 21.20 | 20.99 | .31 | .44                         | .50 | 2.70 |  |
| 1890—No. 1313.     | J. T. Doyle, Cupertino          | Oct. 8                         | 21.50 | 21.50 | .25 | .55                         | .36 | 2.70 |  |
| No. 1237.          | Margherita Vineyard, Fresno     | Aug. 23                        | 24.10 | 23.62 | .30 | No wine.                    | .48 |      |  |
| No. 1417.          | John Gallegos, Mission San José | Oct. 23                        | 26.50 |       | .22 | .70                         |     | 3.08 |  |



to observe, this variety is not injured by coulure, but does not stand rain at the time of maturity, when it rots quickly.

The grapes reach on the average about 23 per cent of sugar, with an adequate acidity. When picked later they reach high sugar, still with an adequate acidity, and then they make a wine high in alcohol, tannin, and body.

Its wine seems to mature quickly, and has not shown itself to be a very good keeper; however, it has some peculiar qualities, and a certain freshness which reminds one of the fresh tasting and pleasantly acid wines produced in northern regions, but it is little colored.

This variety is still under experiment, and therefore a more elaborate account of it will be given in our next report or bulletins.

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## 2. BURGUNDY TYPE.

The name "Burgundy" has been so largely applied to grapes in California, and so many varieties not only completely distinct from each other but having not the smallest resemblance with the Pinots or true Burgundies, have been placed under that designation in different localities, that it would be hard to find any character attributable in common to them all, unless it be those of low color and astringency.

Although it may be difficult to rectify such a popular usage at this time, the matter is of too great and practical importance not to be attended to, for this wrong nomenclature causes numerous disappointments in planting, and serious mistakes in blending.

Without going into the details of the characters of the true Pinots of Burgundy, the following observations may be taken into account:

As growers they are only moderately vigorous; the leaves are of only medium size, not deeply lobed, rather thin, and quite smooth on both surfaces. The bunches are small, but in general numerous, more often conico-cylindrical than cylindrical, as is commonly the case for the Gamai, the berries being quite small and close-packed, nearly round. Their skin is a little thick, and while apparently deep-tinted on the outside, yields but little color, and that of a red, turning into orange rather than purple; in the latter respect they differ essentially from the Bordeaux type of grapes. Besides being lighter colored, they yield also little tannin, and therefore the dilution of their wines with water renders them unpalatable.

Despite these well-defined and easily recognized characters, the names of both Burgundy and Pinot have been applied to grapes having not the least resemblance to them.

The Chauché Noir is in certain localities known as "Burgundy," and is itself badly mixed with the Trousseau. "Pfeffer's Burgundy" is another which is found specially in the Santa Clara Valley; its large, long bunches and large leaves render it decidedly distinct from the Pinots; it produces a wine of light color and medium astringency, but in other respects has more of the claret type; it seems to be the Robin Noir of France.

Another grape, the "Crabb's Burgundy" (probably the Refosco of Italy), which is mostly grown in the Napa Valley, not only figures under that name, but frequently as "Petit Pinot," a bad mistake, not

only as regards the size of its berries, which are several times larger than those of the true Pinots, but also especially as regards its wine-making qualities: high tannin and acid, and intense purplish color, which characterize this variety.

#### THE PINOTS AND THEIR SYNONYMS.

(According to the ampelographers Odart, Rendu Mas, and Pulliat.)

*Pinot or Pineau noir.*—*Syn.*: Noirien; Franc Pinot; Auvernat noir; Orléans; Plant noble; Savignin noir; Schwartz klevner; Noir de Franconie; Czerna okrudla ranka.

*Petit plant doré.*—Variety of the Champagne region, with bunches more winged, longer, and more compact than those of the Pinots of Bourgogne.

*Gros plant doré.*—*Syn.*: Morillon; Maître noir.

*Pinot de Fleury.*—Product more certain and more abundant than that of the Petit plant doré; berries very variable. *Syn.*: Plant de Cumières; Plant médaillé; Auvernat noir; Burgunder, or Bourguignon; Pinot noir; Schwartz clævner; Pinot de Schauenbourg; Schwartz Silvaner; Blaue Bodensee Traube; Pinot de Ribauviller; Pinot aigret; Pinot de Volnay; Pinot dru.

*Noirien de Pernant.*—Vigorous and good bearer; leaves wider than longer, and yellowish-green colored.

*Pinot du Jura.*—Bunches longer, more compact, and more regular; berries slightly oblong. *Syn.*: Salvagnin suisse; Plant meunier; Morillon taconné; Fernaise; Blanche feuille; Plant de Brie; Carpinet; Goujean; Müller Rebe.

*Pinot crepet.*—Wood stronger; leaves and bunches larger than the above Pinots.

*Pinot d'Ischia.*—Pinot Pomier, seedling from Ischia; Pinot de la Madeleine.

*Morillon hâtif.*—*Syn.*: Raisin de la Madeleine; Jacovies; Frühe Magyar Traube; Morrillon violet; apparent precocity in ripening; no special quality.

*Pinot mouret.*—*Syn.*: Tête de nègre; Menu noir; Petit noir.

*Pinot rougin.*—Product of the crossing of the Franc Pinot and Pinot gris.

*Pinot gris.*—*Syn.*: Burot; Fromentot; Petit gris; Auxois; Auxerrat; Gris de Dornot; Affumé, or Enfumé; Gris cordelier; Griset; Muscade-Malvoisie; Auvernat gris; Fauvé, Malvoisien; Ruländer.

*Auxerrois vert.*—Berries less red, tending to greenish color. *Syn.*: Grau Klævner; Auvernat gris; Grauer Tokayer; Sarfeger; Pinot cendré.

*Pinot blanc Chardonay.*—*Syn.*: Chardonay, or Chardenai; Noirien blanc; Epinette; Morrillon blanc; Beaunoir; Auxoir; Plant de tonnerre; Auvernat blanc; Arnoison blanc; Gamai blanc; Meslier jaune; Gentil blanc; Weisser Ruländer, or Weisser Clævner.

*Pinot blanc vrai.*—White type of the Black Pinot that resembles entirely the latter, except in the color of the grapes, which are whitish yellow.

*Pinot Meunier, or Meunier.*—According to Odart it has the same synonyms as the Pinot du Jura. According to Goëthe, the following: Müller traube; Müller weib; Frühe blaue; Blaue Potitschtraube; Cerny mancuik; Rana Modra Mlinaria; Molnar Toke kèk; Trézillon de Hongrie.

According to Hogg: Miller grape; Miller's Burgundy. According to Dupont-Delporte: Pinot femelle.

## REMARKS ON THE PINOTS INTRODUCED IN CALIFORNIA.

*Pinot Noir, Black Pinot, Noirien, Franc Pinot.*—As we have shown in the above synonymy, these names designate only a single variety, the typical characters of which are as follows:

Branches of medium strength, pendant, with long and numerous tendrils; leaves medium size, almost round on fertile vines; upper sinuses almost wanting on well-selected vines, petiolar sinus usually open; teeth not deeply cut, and somewhat obtuse; bunches small, or below medium size, cylindrical or conico-cylindrical, on a peduncle that is rather short and strong; berries small, or below medium size, spherical or spherio-ellipsoidal (on compact bunches); flesh juicy, very sweet; skin rather thick and resistant, and of a fine black color, slightly pruinose (covered with bloom) at the time of maturity, which occurs in the first period. Generally it is pruned long; the pruning, however, must be proportional to the richness of the soil, and to the distance at which the vines are planted. The leaves fall early.

The Pinot Noir has been cultivated in Burgundy since very early times, and it is therefore considered as a native of that region. There, like the Gamay, it is one of the grapes extensively cultivated, which quickly attain complete maturity. On hills and on calcareous soils it gives the best wine; on granitic soils, while the wine has still a certain merit, it is lighter, has less bouquet, and loses its color, and always yields a small crop. On flat lands this grape is much injured by coulure, and its wine is of only fair quality. *This variety does not succeed in southern climates.*

*Pinot de Pernant.*—The vine-growers of Bourgogne generally consider this Pinot as a distinct variety of the Pinot Noir; however, it is only the result of the selection by which there has been obtained a larger bunch, with more berries, and altogether a more stable bearer.

*Pinot de St. Georges.*—This is the same as the Pinot Noir; its bunches look somewhat smaller and looser than in the latter. The name is not found in the ampelographies, and it is probable that it was imported to California from the St. Georges Vineyard, of the Burgundy region.

## TABLE OF PRODUCTION

*Of Pinot Grapes grown at Experimental Plot of John T. Doyle, Cupertino.*

|                |                   | Number of Vines.. | Total Weight of Grapes, in lbs... | Average per Vine, in lbs..... | Date of Picking... |
|----------------|-------------------|-------------------|-----------------------------------|-------------------------------|--------------------|
| 1887—No. 731.  | Franc .....       | 20                | ---                               | ---                           | Oct. 13            |
| No. 703.       | Pernant .....     | 20                | 100                               | 5.0                           | Oct. 6             |
| No. 704.       | Noirien .....     | 20                | 64                                | 3.2                           | Oct. 6             |
| No. 783.       | St. Georges ..... | 20                | 6                                 | .3                            | Oct. 25            |
| 1888—No. 846.  | Franc .....       | 20                | 115                               | 5.8                           | Sept. 13           |
| No. 847.       | Noirien .....     | 19                | 100                               | 5.2                           | Sept. 13           |
| 1889—No. 1077. | Noirien .....     | 20                | 215                               | 10.8                          | Sept. 14           |
| No. 1078.      | Franc .....       | 20                | 225                               | 11.3                          | Sept. 14           |
| No. 1079.      | Pernant .....     | 18                | 190                               | 10.6                          | Sept. 14           |

## ANALYSES OF WINES.

| PINOTS.       | Variety.                                          | Date of Picking. | MUST.                      |                       |                   |      | WINE.      |               |                         |        |      |
|---------------|---------------------------------------------------|------------------|----------------------------|-----------------------|-------------------|------|------------|---------------|-------------------------|--------|------|
|               |                                                   |                  | Solid Contents by Spindle. | Sugar by Copper Test. | Acid as Tartaric. | Ash. | Alcohol.   | Tannin.       | Total Acid as Tartaric. | Borby. | Ash. |
|               |                                                   |                  |                            |                       |                   |      | By Volume. |               | At Pressing.            |        |      |
|               |                                                   |                  |                            |                       |                   |      | By Weight. |               | At Six to Eight Months. |        |      |
| 1884—No. 222. | L. P. Berger, Lakeport.                           | Oct. 15          | 19.58                      |                       | .63               |      | 8.42       | .133          | .75                     | 2.11   | .31  |
| 1885—No. 357. | H. Mel, Glenwood.                                 | Sept. 30         | 21.69                      |                       | .53               | .33  | 8.01       | .110          | .60                     | 2.84   | .32  |
| No. 338.      | H. Keatinge, Lower Lake.                          | Oct. 9           | 20.71                      |                       | .59               | .34  | 8.84       | .143          | No wine made.           | 2.70   | .40  |
| No. 410.      | Father Cichi, Santa Clara.                        |                  |                            |                       |                   |      |            |               |                         |        |      |
| 1886—No. 470. | H. M. La Rue & Sons, Davisville.                  | Sept. 1          | 20.50                      |                       | .52               | .53  | 10.02      | .070          | .53                     | 3.30   |      |
| No. 480.      | F. Seavers, Pomona.                               | Sept. 18         | 24.10                      | 24.12                 | .52               | .30  | 10.81      | .153          | .35                     | 2.85   |      |
| No. 519.      | J. T. Doyle, Experimental Plot, Cupertino.        | Oct. 5           | 24.80                      | 23.20                 | .53               | .33  | 10.02      | .111          | .53                     | 2.22   |      |
| No. 688.      | J. P. Smith, Livermore.                           | Sept. 23         | 21.00                      | 20.90                 | .62               | .30  | 10.61      | .180          | .57                     | 2.80   |      |
| No. 778.      | J. T. Doyle, Experimental Plot, Cupertino.        | Oct. 23          | 20.00                      | 25.76                 | .50               | .44  | 10.54      | .225          | .62                     | 2.70   |      |
| No. 731.      | J. T. Doyle, Experimental Plot, Cupertino.        | Oct. 13          | 27.32                      | 20.99                 | .48               | .55  |            | No wine made. |                         |        |      |
| No. 704.      | J. T. Doyle, Experimental Plot, Cupertino.        | Oct. 6           | 25.47                      | 25.76                 | .48               | .40  | 10.20      | .140          | .50                     | 2.70   |      |
| No. 703.      | J. T. Doyle, Experimental Plot, Cupertino.        | Oct. 6           | 25.99                      | 25.88                 | .63               | .33  | 10.16      | .220          | .57                     | 2.80   |      |
| No. 783.      | J. T. Doyle, Experimental Plot, Cupertino.        | Oct. 25          | 24.84                      | 24.64                 | .42               | .37  | 9.85       | .200          | .30                     | 2.80   |      |
| 1888—No. 834. | J. Gallegos, Experimental Plot, Mission San José. | Sept. 10         | 25.16                      | 25.19                 | .44               | .47  | 9.78       | .194          | .42                     | 2.60   |      |
| No. 846.      | J. T. Doyle, Experimental Plot, Cupertino.        | Sept. 13         | 24.53                      | 24.64                 | .42               | .51  | 9.70       | .150          | .37                     | 3.00   |      |
| No. 847.      | J. T. Doyle, Experimental Plot, Cupertino.        | Sept. 13         | 24.60                      | 24.64                 | .45               | .49  | 9.41       | .148          | .38                     | 2.80   |      |



## COLOR READINGS.

| PINOIS.            | 1886.                                   |                              |                                            | 1887.                                  |                          |                            |                                  |                                   |
|--------------------|-----------------------------------------|------------------------------|--------------------------------------------|----------------------------------------|--------------------------|----------------------------|----------------------------------|-----------------------------------|
|                    | H. M. LaRue<br>& Sons, Davis-<br>ville. | F. Seavers,<br>Pomona.       | J. T. Doyle,<br>Expt'l Plot,<br>Cupertino. | John T. Doyle, Cupertino.              |                          |                            |                                  |                                   |
|                    | No. 470.<br>Petit Pinot.                | No. 480.<br>Pinot.           | No. 519.<br>Pinot St.<br>Georges.          |                                        |                          |                            |                                  |                                   |
| Must               |                                         |                              |                                            | No. 778.<br>Pinot.                     | No. 731.<br>Franc Pinot. | No. 704.<br>Pinot Noirien. | No. 703.<br>Pinot de<br>Pernant. | No. 783.<br>Pinot St.<br>Georges. |
| At pressing { Date |                                         |                              |                                            |                                        |                          |                            |                                  |                                   |
| One month          | Faint yellow,<br>Septemb'r 10.          | Light rose,<br>Septemb'r 28. | October 14.<br>12.6 1 R.<br>9.2 3 R.       | October 1.<br>27.6 3 V. R.<br>9.0 2 R. | 8.0 1 R.                 | October 13.<br>14.5 2 R.   | October 15.<br>19.0 5 V. R.      | November 1.<br>16.5 4 V. R.       |
| Two months         | 7.5 3 R.                                | 12.9 4 V. R.                 | 9.2 3 R.                                   | 8.3 4 R.                               |                          | 9.1 2-3 R.                 | 10.4 3 R.                        | 16.5 4 V. R.                      |
| Three months       |                                         |                              |                                            |                                        |                          | 6.6 4 R.                   | 11.8 2 R.                        | 12.5 R.                           |
| Four months        |                                         |                              |                                            |                                        |                          |                            |                                  |                                   |
| Five months        |                                         |                              |                                            | 8.0 4 R.                               |                          |                            |                                  |                                   |
| Six months         |                                         |                              | 6.3 3 R.                                   |                                        |                          |                            |                                  |                                   |
| Seven months       | Yellow.                                 | 10.0 3 R.                    |                                            | 7.0 4 R.                               |                          | 6.6 4 R.                   | 11.4 3 V. R.                     | 12.2 R.                           |



Color Readings—Continued.

|                                                                                                                                                       |               | 1888.                     |                          | 1889.                     |                                  |                       |                                          |                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------|--------------------------|---------------------------|----------------------------------|-----------------------|------------------------------------------|---------------------------|
| PINOTS.                                                                                                                                               |               | John T. Doyle, Cupertino. |                          |                           | John Gallegos, Mission San José. |                       |                                          |                           |
| J. Gallegos, Ex-<br>Permental Pinot,<br>Mission San José.                                                                                             |               | No. 834.<br>Pinot.        | No. 846.<br>Franc Pinot. | No. 847.<br>Pinot Norten. | No. 1078.<br>Pinot.              | No. 1078a.<br>Blends. | No. 1060.<br>Pernant and<br>St. Georges. | No. 1061.<br>Franc Pinot. |
| Must.<br>At pressing {<br>Date<br>Color<br>One month.<br>Two months.<br>Three months.<br>Four months.<br>Five months.<br>Six months.<br>Seven months. | September 19. | September 20.             | September 20.            | September 20.             | September 23.                    | September 23.         | September 13.                            | September 13.             |
|                                                                                                                                                       | 169 4 V. R.   | 90 3 R.                   | 9.7 3 R.                 | 13.4 2 R.                 | 14.7 1 R.                        | 34.0 5 V. R.          | 3.7 5 V. R.                              | 5.1 V. R.                 |
|                                                                                                                                                       | 100 4 R.      | 7.8 3 R.                  | 9.0 1 R.                 | 6.6 3-4 R.                | 8.0 3 R.                         | 10.0 3-4 R.           | 22.2 1 R.                                | 11.4 3-4 R.               |
|                                                                                                                                                       | 12.9 3 R.     | 7.4 1 R.                  | 9.0 1 R.                 | 6.6 3-4 R.                | 5.1 1 R.                         | 10.0 3-4 R.           | 11.4 3-4 R.                              | 10.0 1 V. R.              |
|                                                                                                                                                       | 14.0 2 V. R.  | 6.2 2 V. R.               | 7.2 3 R.                 | 8.4 2 V. R.               | 5.1 1 R.                         | 10.5 2 R.             | 10.0 1 V. R.                             | 9.3 2 V. R.               |
|                                                                                                                                                       | 13.3 1 V. R.  | 3.5 3 R.                  | 6.5 3 V. R.              | 8.3 4 V. R.               | 5.1 1 R.                         | 10.1 2 R.             | 9.3 3 V. R.                              | 11.4 3-4 R.               |
|                                                                                                                                                       | 11.8 2 V. R.  | 3.6 3 R.                  | 6.6 3 V. R.              | 8.0 4 V. R.               | 5.1 1 R.                         | 10.1 2 R.             | 9.3 3 V. R.                              | 11.4 3-4 R.               |
|                                                                                                                                                       | 12.5 2 V. R.  | 3.6 3 R.                  | 6.6 3 V. R.              | 8.0 4 V. R.               | 5.1 1 R.                         | 10.1 2 R.             | 9.3 3 V. R.                              | 11.4 3-4 R.               |
|                                                                                                                                                       | 12.5 2 V. R.  | 3.6 3 R.                  | 6.6 3 V. R.              | 8.0 4 V. R.               | 5.1 1 R.                         | 10.1 2 R.             | 9.3 3 V. R.                              | 11.4 3-4 R.               |
|                                                                                                                                                       | 12.5 2 V. R.  | 3.6 3 R.                  | 6.6 3 V. R.              | 8.0 4 V. R.               | 5.1 1 R.                         | 10.1 2 R.             | 9.3 3 V. R.                              | 11.4 3-4 R.               |

**NOTE.**—The letter Y in the above table denotes that in order to reach the typical tint, one disk of yellow glass (or two, as the case may be) had to be used on the type-color disk.

*No. 688. Pinot.* From J. P. Smith, Livermore. The grapes arrived September 26, 1887, and were worked the same day. Their condition was good, but the bunches very irregular on account of coulure, and some entirely unlike Pinot in consequence. Berries also very varied in size; on badly coulured bunches very large, on close ones very small; few bunches are quite characteristic, like the imported short ones of ordinary years. Taste *very* neutral, sugar apparently not above 18 per cent. Many berries dried unripe. The juice showed 21 per cent of solid contents. Fermentation of 74 pounds crushed began on September 27th; on September 28th it was quite violent, and reached its maximum of 82° on September 30th. On October 1st, five days from crushing, it was drawn off. The yield from the above amount was 5½ gallons, or at the rate of 158 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 19.* Condition barely clear, bouquet exceedingly striking, acid sound but somewhat excessive, wine rather flat-tasted. A microscopical examination of the sediment shows much effete yeast, many small lactic and a few acetic germs.

1888. *January 23.* Racked and pasteurized the wine.

*February 9.* Bouquet well developed and very agreeable, but the wine tastes hurt and milk-sour, and is, at present, flat and thin.

*May 5.* Bouquet and vinosity well advanced, wine somewhat flat as yet, but has no noticeable lactic taste.

*May 23.* Racked the wine. The microscope still shows some lactic germs in the sediment.

*No. 703. Pinot de Pernant.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 7, 1887, and were crushed the following day. They were overripe, many berries shriveled, but mostly from late coulure; sugar not very high or acid very high in grapes just ripe; many very small bunches; will not make a fair test of wine. The juice showed 25.99 per cent of solid contents. Fermentation of 73 pounds crushed began on October 9th, and reached its maximum of 91° on October 10th, the fermentation being very violent. It then moderated, and on October 14th, seven days from crushing, it was drawn off. The yield from the above amount was 5⅓ gallons, or at the rate of 142 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 8.* The young wine was racked from the lees.

*December 19.* Condition slightly turbid, and bouquet undeveloped; the body is heavy, acid and astringency low; a promising wine, but undeveloped.

1888. *February 16.* A bright-conditioned, pleasant, smooth wine, with well-advanced bouquet and low astringency.

*April 26.* Under the microscope the sediment shows only traces of lactic germs, but for safety it was racked and pasteurized.

*June 19.* Condition bright, with well-advanced bouquet, medium-high astringency; the acid is just the least bit sharp, and in after-taste gives an impression of lactic ferment.

1889. *November.* Condition bright and color a brilliant red, but bouquet poor; body low, acid high, but aside from this the wine is still fair.

*No. 704. Pinot Noirien.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 7, 1887, and were crushed the following day. In condition very much like No. 703, overripe, many dried and very small berries, all somewhat flabby; apparently sweeter than No. 703. The juice showed 25.47 per cent of solid contents. Fermentation of 41 pounds crushed began on October 9th, and reached its maximum of 87° on the following day. On October 13th, six days from crushing, it was drawn off. The juice from above amount was 3⅓ gallons, or at the rate of 152 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 19.* Condition nearly clear, with heavy body, pronounced and agreeable bouquet, acid and astringency low; a very promising wine of no color.

1888. *January 23.* The wine was racked.

*February 16.* Condition bright, with a well-developed bouquet; acid and astringency moderate; a pleasant, smooth wine of remarkable vinosity for its age.

*April 26.* A microscopical examination of the sediment shows only traces of acetic and lactic germs; racked and pasteurized the wine for safety.

*June 26.* Condition bright, with a good vinous flavor, medium astringency, good body, the acid a little sharp, with lactic after-taste.

*No. 731. Franc Pinot.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 14, 1887, and were crushed the same day. Their condition was good, but somewhat overripe; many berries half dried; characteristic short, cylindrical bunches, close-packed, small berries; little coulure, not over 5 per cent. Does not strike one as very sweet; but should have been gathered ten days sooner, as it would yield a heavier wine than if in its normal condition. The juice showed 27.32 per cent of solid contents; acid, .48 per cent. Only 13 pounds were received, so no wine was made.

*No. 778. Pinot.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 26, 1887, and were crushed the following day. Their condition was only fair; overripe, many bunches shriveled; much early coulure, often reducing bunches to a few berries; bunches small and cylindrical. The juice showed 26 per cent of solid contents. Fermentation of 42 pounds crushed began on October 28th, and reached its maximum of 79° on October 30th. On November 1st, five days from crushing, it was drawn off. Appears slightly acetified, judging by the odor. The yield from the above amount was  $2\frac{1}{4}$  gallons, or at the rate of 128 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 20.* Condition turbid, with fairly developed bouquet, medium acid, quite low astringency; a well-tasted but thin-bodied wine. Racked and pasteurized the sample for safety.

1888. *January 20.* Racked the wine again.

*February 16.* (In glass.) Carbonic acid gas spoils or covers the other qualities of the wine.

*June 4.* Condition bright, with well-advanced bouquet; acid slightly sharp and unpleasant in after-taste; body not very heavy.

A microscopical examination shows in the sediment effete yeast and traces of lactic ferment. Again racked the wine.

*No. 783. Pinot St. Georges.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 26, 1887, and were crushed the following day. Condition good; some slightly overripe; very little coulure; bunches small; berries close-packed, sweet, yet sub-acid; remarkably so for a Pinot. Last year this variety was among the very earliest; now comes quite late, yet appears to be only a week or so after maturity. The juice showed 24.83 per cent of solid contents. Fermentation of 31 pounds crushed began on October 28th, and reached its maximum of 81° the following evening, October 29th; this quickly fell. On November 1st, five days from crushing, the murk was drawn off. The yield from the above amount was  $1\frac{1}{2}$  gallons, or at the rate of 121 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 19.* Racked the young wine from the lees.

*December 20.* Condition clear, with fairly developed bouquet, pleasant acid, heavy body, and low astringency; general quality high.

1888. *February 16.* Condition turbid; aside from this, same as at last tasting.

*May 31.* A microscopical examination of the sediment shows a large amount of effete yeast and some lactic germs; racked and pasteurized the samples.

*June 20.* Sample kept in glass. Condition clear, with fairly developed bouquet, somewhat sharp acid, and an after-taste slightly of lactic ferment; astringency not high; wine as a whole passable.

*No. 834. Pinot.* From J. Gallegos, Experimental Plot, Mission San José. The grapes arrived September 13, 1888, and were crushed the same day. Juice showed 25.16 per cent of solid contents. A few moldy bunches were removed from the package before crushing. Fermentation was commenced September 14th, and reached its maximum of 88° two days later. On September 19th, six days from crushing, the murk was drawn off, yielding 3 gallons from 41 pounds crushed, corresponding to 146.4 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *October 29.* Condition clear and action ceased; racked and taken to cellar.

*December 10.* Lees examined under the microscope; show traces of acetic germs; pasteurized; bouquet undeveloped; acid high and sharp.

*1889. February 27.* Racked again.

*August 2.* A bright, good red wine, of rather pleasant bouquet, good flavor and clear taste, with well-proportioned acid and astringency, and rather high alcohol; quality good; stands dilution with 50 per cent of water well.

*1890. February 1.* Aside from a few mold spores, the sediment shows no unsound germs.

*February 13.* Condition bright, bouquet good; flavor agreeable, but with a suspicion of lactic taint; wine quite mature.

*No. 837. Blend* ( $\frac{2}{3}$  Pinot de Pernant,  $\frac{1}{3}$  Pinot St. Georges.) From J. T. Doyle, Experimental Plot, Cupertino. This blend was accidentally made. Grapes arrived on September 13, 1888, in good condition, and were crushed the same day; the juice showed 23.79 per cent of solid contents. Fermentation of 132 pounds crushed began on September 15th, and reached its maximum temperature of 90° on September 18th. On September 19th, five days from crushing, the murk was drawn off, yielding for the above amount 10 gallons, or at the rate of 151.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Taken to cellar.

*December 10.* Lees show traces of lactic germs; wine was pasteurized. A very pleasant, well-tasted, and smooth wine; better than Franc Pinot, No. 846; of advancing bouquet and high tannin.

*1889. January 12.* Good, but heavy wines of light color; we seem to have no special use for them now. (This taste refers in general to all Pinots.)

*February 27.* Racked. Sediment shows traces of lactic germs.

*April 2.* Tastes somewhat "mousey," as though from lactic taint.

*August 2.* Condition bright, with red color; rather pleasant bouquet; not much flavor, save of lactic taint. Acid full, medium astringency, quality only fair; stands dilution fairly well.

*1890. February 1.* Lees show a considerable amount of lactic germs, but nearly, if not quite all, dead.

*February 25.* Clear; bouquet and flavor quite spoiled by lactic fermentation.

*No. 846. Franc Pinot.* From J. T. Doyle, Experimental Plot, Cupertino. Grapes arrived and were worked September 14, 1888. Condition good, but some bunches overripe, many bunches having wrinkled, half-dried berries, amounting in some cases to over 30 per cent; some early coulure. Bunches small and cylindrical, with uneven-sized berries. Juice showed 24.56 per cent of solid contents. Fermentation of 77.5 pounds crushed began September 16th, and reached its maximum of 87° the next day. On September 20th, six days from crushing, the murk was drawn off. The yield from the above amount was 6 gallons, corresponding to 154.8 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Taken to cellar.

*December 10.* Wine very undeveloped, and rough to the taste. Lees show traces of lactic ferment; the wine was pasteurized.

1889. February 27. Racked.

April 2. Wine clear, but has a lactic taint; pasteurized again.

August 2. Condition bright, with a light and very yellowish color, very faint bouquet, nutty flavor, and a taste well developed for its age; medium and agreeable acid, low astringency, medium alcohol, quality good; would stand dilution pretty well, if it had more color.

November 4. The same as at last tasting, except a slight "mousey" odor; racked again.

1891. February 2. Wine in demijohn light, with fair flavor, but thin, and not pleasant in after-taste.

**No. 847. Pinot Noirien.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived on September 14, 1888, and were worked the same day; condition fair. Stems green; bunches small, some slightly shouldered, others cylindrical; on exposed bunches the berries are overripe; berries uneven in size; color of skin and juice not so deep as that of Franc Pinot. The juice showed 24.16 per cent of solid contents. Fermentation of 76.5 pounds crushed began on the 15th, and reached its maximum of 87° three days later. On September 20th, six days from crushing, the murk was drawn off. The yield from the above amount was 6 gallons, or at the rate of 156.9 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. October 31. Racked.

November 2. Taken to cellar.

December 10. Taste is rough and unpleasant; acid is sharp and high; tannin is adequate. Lees upon examination show lactic ferment; pasteurized the wine.

1889. February 27. Racked again; sediment shows dead lactic germs.

August 2. Condition not quite bright, but the color is rather better than No. 846, Franc Pinot; undeveloped bouquet, full acid, average astringency and alcohol, quality fair; does not dilute well.

1890. February 3. Lees show many lactic germs; short filaments.

February 15. Condition clear, with light color; the bouquet and flavor spoiled by lactic fermentation.

**No. 1061. Franc Pinot.** From J. Gallegos, Experimental Plot, Mission San José. Condition overripe, with many grapes dried up and some very moldy. Carefully sorted over, and about half rejected. They arrived September 12, 1889, and were worked the same day. The juice showed 26.5 per cent of solid contents. The 35½ pounds crushed commenced to ferment on the morning of the 14th. After a gentle fermentation, with a maximum temperature of 89°, the murk was drawn off, having been ninety-six hours in the vat. The yield from the above amount was 2.57 gallons of wine, corresponding to 148 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. October 14. Condition nearly clear; of fair color, good bouquet, clean and pleasant taste.

November 2. Racked and taken to the cellar.

1890. February 6. Lees show some lactic germs.

March 27. Pasteurized.

June 15. Clear, and without any positively bad taste, but thin and exhausted.

July 14. Deteriorated.

**Blend of  $\frac{5}{11}$  Pinot de Pernant (No. 1060) and  $\frac{6}{11}$  Pinot St. Georges (No. 1063).** From the Experimental Plot of J. Gallegos, Mission San José. The grapes could not be distinguished from the Franc Pinot, except the Pinot St. Georges, which had a little looser bunches; condition overripe, many grapes dried up and many bunches moldy. The grapes were sorted over carefully and about half rejected. They arrived September 12, 1889, and were crushed the same day. The Pinot de Pernant showed 26.1 per cent of solid contents; the Pinot St. Georges, 27.73 per cent. Nineteen pounds of the former and 25 pounds of the latter were fermented together. Fermentation started on the morning of the 14th, the mash smelling very moldy. The fermentation was

strong, the maximum temperature being 91°. On the 16th the wine was pressed, being still a little sweet, after ninety-six hours in the vat. There were obtained  $3\frac{3}{8}$  gallons of wine, corresponding to 141.75 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. October 14. Condition cloudy; color fair; carbonic acid gas covers the flavor.

November 2. Racked and taken to the cellar.

1890. January 17. Condition still cloudy, with bad bouquet and lactic flavor. Sediment contains an abundance of lactic and acetic germs.

March 24. Pasteurized.

June 13. Clear and improved; lactic taste much diminished.

July 31. Lees show lactic germs.

*Blend of Pinot Noirien* (No. 1077), *Franc Pinot* (No. 1078), *Pinot de Pernant* (No. 1079). From the Experimental Plot of J. T. Doyle, Cupertino.

The *Pinot Noirien*, with cylindrical, sometimes shouldered bunches and small grapes, arrived in very bad condition, crushed, and moldy; completely mature.

The *Franc Pinot* differed from the above in having no shoulders to the bunches; the condition is very bad, moldy, and crushed; maturity complete.

*Pinot de Pernant*: Bunches cylindrical and slightly winged; grapes rather large for Pinot; condition very bad, moldy, and much bruised.

These three varieties, together with No. 1074, were crushed together, and made into two wines, numbered 1078 and 1078a. The former, consisting of 288 pounds, was placed in a closed vat on September 19th (temperature of mash, 70°). Foulage was practiced once a day. The maximum temperature reached was 93.5° on the second day. The wine was drawn off at the end of ninety-six hours. The wine obtained was at the rate of 146.9 gallons per ton.

No. 1078a, consisting also of 288 pounds (solid contents 25 per cent, as in the former), was fermented in the ordinary way; temperature of room, 72°.

Fermentation commenced on the morning of September 20th, the day after crushing, at a temperature of 75°. The maximum reached was 99°, very little froth being formed. On September 23d the wine was drawn off, being still a little sweet and the cap hard.

RECORD OF TREATMENT AND TASTING.—No. 1078.—1889. November 7. Condition turbid; no bouquet; low acid, flat taste, and bitter.

November 22. Racked and taken to the cellar.

1890. January 14. Not quite clear, with light color, and flavor moldy, and disagreeable bouquet; smooth taste; after-taste slightly bitter; medium acid, full astringency; alcohol and body full; quality poor, but wine apparently sound.

January 29. Lees show very few small lactic germs.

April 12. Racked again.

No. 1078a.—1889. November 7. Condition clearer than No. 1078; bouquet faint; acid slightly higher, and general quality more pleasant.

November 27. Racked and taken to the cellar.

1890. January 14. Condition nearly clear, with light color; bouquet not marked; agreeable flavor, smoothly developed taste, low acid, full tannin, alcohol, and body; quality rather good; much superior to No. 1078.

January 15. Lees show no abnormal germs.

May 3. Condition clear and good.

May 15. Lees still sound.

#### BLAUER BURGUNDER.

This variety, known also in the Beaujolais region under the name of *Bourguignon Noir*, is identical with the *Pinot Noir*.

No. 1074. (Vintage of 1889.) From J. T. Doyle, Experimental Plot,

Cupertino. Grapes arrived September 17th, and were worked the same day. They were in bad condition, some being moldy; maturity was too advanced. The 40.5 pounds received were crushed with red Pinots from Cupertino to make two blends. For records, see Nos. 1078 and 1078a.

In the season of 1890 only a few bunches of these grapes were received from Cupertino and Fresno. The following table shows the analysis of the must. In general the grapes were overripe:

WINE ANALYSES.

| BLAUER BURGUNDER.                             | Date of Picking..... | MUST.                              |                               |            |           |
|-----------------------------------------------|----------------------|------------------------------------|-------------------------------|------------|-----------|
|                                               |                      | Solid Contents<br>by Spindle ..... | Sugar by Copper<br>Test ..... | Acid ..... | Ash ..... |
| 1889—No. 1074. John T. Doyle, Cupertino ..... | Sept. 14             | 27.45                              | 26.99                         | .67        | .39       |
| 1890—No. 1392. John T. Doyle, Cupertino ..... | Oct. 19              | 29.70                              | .....                         | .34        | .....     |
| No. 1232. Margherita Vineyard, Fresno .....   | Aug. 24              | 25.40                              | 24.64                         | .42        | .38       |

## MEUNIER.

The Meunier (Miller, so called from the conspicuously white furze on its leaves) is closely related to the Pinot or Burgundy group in most of its characters. It is extensively cultivated in central and northern France, and in Germany, as specially adapted to the less favorable locations and soils in which the other varieties would fail to yield and ripen fruit well. It seems to enjoy a higher estimation in France than in Germany, where its wine is held to be considerably below the quality of the Pinots proper, and as best utilized in blends. It is there reported to yield deep-tinted wines of a roughish character and of inferior bouquet.

Meunier wines in California mostly justify the German rather than the French estimate of their quality, being at first, at least, rather flat and lacking character, and sometimes, contrary to European experience, color. It has, perhaps, not found its proper soil as yet. Being hardy and early ripening, it may succeed in the northern part of the State, and on soils on which vines of higher qualities would fail to bring remunerative returns. It may be pruned long or short, according to the strength of the soil.

TABLE OF PRODUCTION.

| MEUNIER.                                                     |  | Number of Vines.. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs..... |
|--------------------------------------------------------------|--|-------------------|---------------------------------------|----------------------------------|
| 1887—No. 733. J. T. Doyle, Experimental Plot, Cupertino..... |  | 20                | 22                                    | 1.1                              |
| 1888—No. 844. J. T. Doyle, Experimental Plot, Cupertino..... |  | 20                | 50                                    | 2.5                              |
| No. 863. J. Gallegos, Mission San José.....                  |  | 5                 | 55                                    | 11.0                             |

## ANALYSES OF WINES.

| MEUNIER.                                                                         | MUST.                                |          |       |       | WINE.           |       |                |      |                         |     |                             |   |            |      |           |  |
|----------------------------------------------------------------------------------|--------------------------------------|----------|-------|-------|-----------------|-------|----------------|------|-------------------------|-----|-----------------------------|---|------------|------|-----------|--|
|                                                                                  | Date of Picking.....                 |          |       |       | Alcohol.        |       | Tannin.....    |      | Total Acid as Tartaric. |     | Volatile Acid .....         |   | Body ..... |      | Ash ..... |  |
|                                                                                  |                                      |          |       |       | By Weight ..... |       | By Volume..... |      |                         |     | At Six to Eight Months..... |   |            |      |           |  |
|                                                                                  |                                      |          |       |       |                 |       |                |      |                         |     | At Pressing .....           |   |            |      |           |  |
| 1884—No. 223.                                                                    | Wm. Scheffler, St. Helena.....       | Sept. 16 | 22.73 | 21.39 | .46             | 10.07 | 12.55          | .030 | .33                     | .53 | —                           | — | —          | 2.55 | .42       |  |
| 1887—No. 224.                                                                    | H. Mel, Glenwood.....                | Oct. 5   | 19.35 | —     | .60             | 6.95  | 8.64           | .060 | .62                     | .62 | —                           | — | —          | 2.44 | .29       |  |
| 1885—No. 337.                                                                    | H. Keatings, Lower Lake.....         | Sept. 7  | 23.52 | —     | .43             | —     | —              | —    | —                       | —   | —                           | — | —          | —    | .31       |  |
| 1886—No. 413.                                                                    | Wm. Scheffler, St. Helena*.....      | —        | —     | —     | —               | —     | —              | —    | —                       | —   | —                           | — | —          | —    | —         |  |
| 1886—No. 520.                                                                    | John T. Doyle, Cupertino.....        | Oct. 5   | 22.80 | 22.23 | .47             | —     | —              | —    | .55                     | .45 | .31                         | — | —          | 2.56 | —         |  |
| —No. 544.                                                                        | John T. Doyle, Cupertino.....        | Oct. 22  | 25.00 | 24.64 | .38             | —     | —              | —    | .40                     | .69 | —                           | — | —          | 2.42 | —         |  |
| 1887—No. 733.                                                                    | John T. Doyle, Cupertino.....        | Oct. 13  | 23.15 | 27.65 | .42             | —     | —              | —    | —                       | .76 | —                           | — | —          | 2.72 | —         |  |
| 1888—No. 844.                                                                    | John T. Doyle, Cupertino.....        | Sept. 13 | 24.11 | 24.12 | .34             | —     | —              | —    | —                       | .46 | —                           | — | —          | 3.60 | —         |  |
| —No. 863.                                                                        | John Gallegos, Mission San José..... | Sept. 13 | 24.41 | 24.86 | .45             | —     | —              | —    | —                       | .60 | —                           | — | —          | 2.70 | —         |  |
| 1889—No. 1062.                                                                   | John Gallegos, Mission San José..... | Sept. 9  | 24.80 | 24.64 | .38             | —     | —              | —    | —                       | .49 | —                           | — | —          | —    | —         |  |
| 1890—No. 1259.                                                                   | John Gallegos, Mission San José..... | Sept. 24 | 24.60 | —     | .57             | —     | —              | —    | —                       | .84 | —                           | — | —          | 2.95 | —         |  |
| —No. 1280.                                                                       | John T. Doyle, Cupertino.....        | Oct. 1   | 24.55 | —     | .53             | —     | —              | —    | —                       | —   | —                           | — | —          | —    | —         |  |
| —No. 1212.                                                                       | Margherita Vineyard, Fresno.....     | Aug. 22  | 24.10 | 23.61 | .41             | —     | —              | —    | —                       | —   | —                           | — | —          | —    | —         |  |
| * Wine sent for examination. † December, 1886. ‡ June, 1887. § Wine sample lost. |                                      |          |       |       |                 |       |                |      |                         |     |                             |   |            |      |           |  |



## COLOR READINGS.

| MEUNIER.                 | 1886.                             |                                   | 1887.                 | 1888.                          |                   | 1889.                                                  |
|--------------------------|-----------------------------------|-----------------------------------|-----------------------|--------------------------------|-------------------|--------------------------------------------------------|
|                          | John T. Doyle, Cupertino.         |                                   |                       | J. Gallegos, Mission San José. |                   |                                                        |
|                          | No. 520.                          | No. 544.                          | No. 733.              | No. 844.                       | No. 863.          | No. 1062.                                              |
| Must. ....               | Rose.<br>Oct. 15.<br>15.1 5 V. R. | Pale rose.<br>Nov. 3.<br>9.6 1 R. | Oct. 25.<br>11.7 2 R. | Sept. 20.<br>10.7 1 R.         | Oct. 1. R.        |                                                        |
| At pressing { Date. .... | 7.5 1 R.                          |                                   |                       | 9.5 3 R.                       | Oct. 22.2         |                                                        |
| { Color. ....            | 9.6 2 R.                          | 13.3 3 R.                         | 11.2 2 R.             | 10.1 3-4 R.                    | 3.7 1 R.+1 Y.     |                                                        |
| One month. ....          |                                   |                                   |                       | 10.7 3 R.                      | 18.4 Sept. 16. R. |                                                        |
| Two months. ....         |                                   |                                   |                       | 8.8 4 R.                       |                   |                                                        |
| Three months. ....       |                                   |                                   |                       | 9.3 4 R.                       |                   |                                                        |
| Four months. ....        |                                   |                                   |                       |                                |                   |                                                        |
| Five months. ....        | 9.6 3 R.                          | 12.5 3 R.                         | 10.0 2 R.             |                                |                   |                                                        |
| Six months. ....         |                                   |                                   |                       |                                |                   |                                                        |
| Seven months. ....       |                                   |                                   | 10.0 O. R.            |                                |                   |                                                        |
| Eight months. ....       | 6.7 O. R.                         | 12.5 3 R.                         |                       |                                |                   |                                                        |
|                          |                                   |                                   |                       |                                | Sample lost.      |                                                        |
|                          |                                   |                                   |                       |                                |                   | 9.9 5 V. R.+1 Y.<br>8.6 4 V. R.+1 Y.<br>8.6 4 V. +1 Y. |

**No. 703. Meunier.** From John T. Doyle, Cupertino. The grapes arrived October 14, 1887, and were crushed the following day. Their condition was good, but most of them overripe; berries partly wrinkled; bunches small. The lot will give a wine 20 per cent too dense, and not a reliable sample. The juice showed 29.15 per cent of solid contents. Fermentation of 21.50 pounds crushed began on the morning of October 16th, and reached its maximum of 85° on the following day, the fermentation remaining very violent for three days. On October 25th, ten days from crushing, it was drawn off. The yield from above amount was 1½ gallons, or at the rate of 119 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 20.** Condition slightly turbid, with fairly developed bouquet and sharpish acid. Racked and pasteurized the wine for safety.

**1888. February 16.** (In glass.) Condition bright, with fairly developed bouquet, a somewhat bitterish taste, sharpish but not offensive acid.

**June 30.** (In glass.) Condition hardly bright; bouquet not very much developed; medium acid, quite marked astringency, and of good quality.

**No. 844. Meunier.** From J. T. Doyle, Cupertino. The grapes arrived in good condition on September 14, 1888, and were worked the same day. Bunches were small and mostly compact; some berries slightly shriveled. Juice showed 24.11 per cent of solid contents. Fermentation of 67 pounds crushed began October 17th, and reached its maximum of 87° two days later. On September 28th, six days from crushing, the murk was drawn off. The yield from the above amount was 5½ gallons, corresponding to 156.7 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. October 29.** Wine clear; action ceased; sample taken to cellar.

**December 13.** Wine clear and almost bright; undeveloped bouquet; sharp acid; rather high astringency; medium alcohol. Whole wine rough. A microscopic examination of lees shows small amount of lactic and acetic germs; racked and pasteurized.

**1889. February 28.** Racked again; lees show effete yeast and small amount of dead lactic germs.

**August 2.** Condition bright, with a medium red color, undeveloped bouquet, flavor light, agreeable taste, full acid, medium astringency, fair quality, stands some dilution.

**1890. February 1.** Lees show many dead lactic germs.

**February 15.** Condition bright, with light color; bouquet and flavor affected by lactic taint.

**March 5.** Racked into glass.

**1891. January 31.** Quite spoiled.

**No. 863. Meunier.** From J. Gallegos, Mission San José. Only a small sample (5 pounds) of this was received on September 25th. Condition was good, bunches very loose, berries characteristic. Juice showed 24.41 per cent of solid contents. Fermentation started at 87° on September 28th; reached its maximum of 90° two days later, where it stood till October 1st, when the murk was drawn off, five days from crushing. The yield from 5 pounds crushed was  $\frac{1}{8}$  of a gallon. The sample was lost on October 5th.

**No. 1062. Meunier.** From J. Gallegos, Mission San José. The grapes arrived September 12, 1889, and were crushed the same day. Juice showed 24.8 per cent of solid contents. They were rather overripe and very moldy, and were sorted over carefully, and about two thirds rejected. Fermentation commenced September 14th and reached its maximum of 91° on September 15th, fermenting violently. The murk was drawn off September 16th at 78.5°, being nearly dry. The yield from 37 pounds crushed was 2.87 gallons, or at the rate of 155½ gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 24.* Condition cloudy; wine as a whole not good.

*November 2.* Racked and taken to the cellar.

1890. *January 15.* Condition cloudy; odor bad; taste quite spoilt (wine was over-looked in filling up).

*January 18.* Lees contain an abundance of active lactic germs.

*March 25.* Pasteurized.

1891. *January 14.* Racked; clear, somewhat improved, but flat and "pricked," and was distilled.

### *Discussion of Results.*

From the above records it appears that the different Pinots are, in general, small bearers, and that the crop of 1889, which, at the Cupertino Experimental Plot, was at the rate of little over 3.6 tons per acre for the Franc Pinot and the Pinot de Pernant, can be considered only as abnormal, since they have yielded much less in all the other seasons. A comparison in this respect shows, moreover, that the Pinot St. Georges is, at least in California, the poorest bearer of all the Pinots; while the Meunier, which belongs to the same group, yields generally as much as the Pinot Noir and the Pinot de Pernant. The time of maturity is the same for all.

The grapes reach easily on the average 25 per cent of sugar, and have a medium to low acidity; when, however, they are much injured by coulure, which occurs often on the Pinots planted on valley lands, the above percentage of sugar is much reduced.

The yield of juice in pressing is rather low, averaging 146 gallons.

The wines contain on the average about 12 per cent of alcohol by volume, and have a somewhat high acidity, which seems due to the abnormal fermentations, which in this climate so easily develop in them, rather than to the character of the wines themselves. Besides, they are of medium or lower astringency, of low color, tending to orange-red, and quite unstable; and on the whole of good body.

As regards the keeping qualities of the Pinot wines, we can say that they have been shown to be very poor, being easily attacked by secondary fermentations, especially by the lactic and acetic.

On the whole, then, the cultivation of the Pinots in California cannot be recommended as suitable for large-scale production, but only as a luxury in particularly favorable locations. Their low production, expensive handling on account of long-pruning and small bunches, the low percentage of juice, the unstable character of the wine when grown in a warm climate, together with its indifferent quality when produced under such conditions, place this otherwise so desirable a group among those which only the amateur may afford to indulge in.

The Meunier, as compared to the other Pinots, yields about the same crop as the Black Pinot and the Pinot de Pernant.

On the average, the grapes attain to about 25 per cent of sugar, and tend mostly to low acidity.

Its wine contains about 12 per cent of alcohol by volume, and is rather acid. This acidity is not natural, but develops during the secondary fermentations, which attack its wine quicker than the wines of the other Pinots, and evidently in this respect it is a very poor keeper. Besides, it is rather light colored, of a roughish character, and with a bouquet inferior to the other Pinots.

## RULÄNDER.

This variety is very distinct from the American Ruländer or the Louisiana, although supposed to be identical by several viticulturists. It is named from Ruland, who propagated it very extensively. It is the same as the Pinot Gris of France, and does not form a distinct variety of the Black Pinot, but a simple color variation. It has absolutely the same characters as the latter, and matures at the same time.

It is grown in Germany, and especially in France. In the Champagne region it is much esteemed, and yields wines of high reputation, such as those of Sillery and Verzenay; in Alsace it produces the famous straw-wines. According to the ampelographer Odart, the characters of the product of this variety are well maintained in Crimea, where it has been cultivated to a certain extent for a long time.



No. 1066. *Ruländer*. From J. Gallegos, Mission San José. The grapes arrived September 12, 1889, in fair condition and quite ripe, but in small quantity, only sufficient for must analysis. Leaves medium size and thick; upper sinuses not deep; lower sinuses hardly marked; basal sinus deep and open; petiole (leaf stem) long and strong; teeth rather obtuse and irregular; bunches small and rather close, cylindrical and without wings or shoulders; grapes small, round, sometimes a little oval; skin thick, and color a dull gray-red. Juice showed 28 per cent of solid contents.

No. 1076. *Ruländer*. From J. T. Doyle, Cupertino. The grapes arrived September 17, 1889, in bad condition; maturity too advanced, some grapes being dried up. Exactly like No. 1066. Juice showed 25.45 per cent of solid contents.

The *Ruländer* in our experimental plots has proved to be quite vigorous under the long-pruning system, and more productive than the other Pinots, not being, like the latter, so much injured by colure and sunburn; but we do not know whether it will maintain this quality, for being itself a Pinot, it may lose it when it has been cultivated for a longer time in the State.

In the season of 1890 at the Cupertino Experimental Plot the crop was at the rate of about 3.6 tons per acre.

The grapes mature at the same time as the Pinots, and easily reach over 25 per cent of sugar. They have shown also that they keep fairly well on the vine, reaching a larger amount of sugar (as much as 28 per cent in the season of 1889 at Mission San José); the grapes may therefore be well adapted in this State for the making of the so-called straw-wines. When the grapes are picked at the proper time for the making of dry wines, they contain, as the Pinots do in general, an adequate acidity.

The grapes received at the University cellar were insufficient in quantity for wine-making, except in the year 1890; in the other seasons but small samples for must analysis were obtained.

The grapes of 1890 were worked for white wine, which proved of very good quality; but the sample from Cupertino was much better than that from Mission San José. These wines prove to be quite good keepers, and much better in quality than the other Pinots; they are of good body, of fresh taste and high vinosity, and one would not exaggerate in saying that they are as good as the French product. We will give special attention to this valuable grape, for as far as we can see it constitutes the only Pinot which gives very satisfactory results in California.

#### PFEFFER'S CABERNET.

The variety known under this name is originally derived from a few stocks grown on the place of Mr. Wm. Pfeffer, Guberville, Santa Clara County. The good quality of its wine has long attracted attention, and it has been planted pretty largely at several points in the Santa Clara Valley, as well as in that of Livermore. A sample made at the University Laboratory was awarded the highest praise by the Wine Committee at the Viticultural Convention of 1885. There is therefore no question as to the high quality of the wine; but the identity of the vine with the Cabernet Franc imported by Mr. Doyle and Mr. Krug cannot be maintained. It differs at the first glance, in that the leaf is larger, of a soft,

"blankety" texture, and correspondingly thicker and very much more uneven on the upper surface than that of the Cabernet Franc. It is also much less deeply cut, and its teeth are different. The basal lobes mostly cross so as to close the basal sinus. The bunches are almost as unlike as the leaf; while in the imported Cabernet Franc they are loose, so as to leave the stems visible here and there all over the bunch, in Pfeffer's vine they are remarkably close and compact, short-stemmed, strongly shouldered, and often almost cylindrical, and very long. The berries outwardly resemble the Cabernet Franc, being of about the same size and aspect, but they are more delicate-skinned, and not as good keepers as the other variety; rather more juicy, too, and yielding a much less deeply colored wine. A striking difference also exists in the seeds; those of the two authenticated Cabernets are rather broad and short, and very short-stemmed; the stem is of a brown tint even when fresh. In Pfeffer's plant the seeds are elongated, with a thick, long, and strikingly green stem.

By some, this grape has been thought to resemble more the Burgundies or Pinots than the Cabernets, yet its relatively large leaf does not bear out this relationship, nor does the wine.

It seems to be the Robin Noir of France, with which, besides the resemblance of the typical character of the fruit, it shares also a little of the special Cabernet flavor found in the Pfeffer's grape.

TABLE OF PRODUCTION.

| PFEFFER'S CABERNET (Robin Noir?).                       | Number of Vines. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs..... | Date of Picking... |
|---------------------------------------------------------|------------------|---------------------------------------|----------------------------------|--------------------|
|                                                         |                  |                                       |                                  |                    |
| 1888—No. 909 (long-pruned). J. T. Doyle, Cupertino....  | 20               | 145                                   | 7.25                             | Oct. 10            |
| 1889—No. 1160 (long-pruned). J. T. Doyle, Cupertino.... | 20               | 340                                   | 17.00                            | Oct. 15            |

## ANALYSES OF WINES.

|                | PFEFFER'S CABERNET (Robin Noir).    | MUST.                |       |       |       | WINE.                          |                         |                        |           |           |                |             |                         |                             |            |           |            |
|----------------|-------------------------------------|----------------------|-------|-------|-------|--------------------------------|-------------------------|------------------------|-----------|-----------|----------------|-------------|-------------------------|-----------------------------|------------|-----------|------------|
|                |                                     | Date of Picking..... |       |       |       | Solid Contents by Spindle..... | Sugar by Copper Test... | Acid as Tartaric. .... | Ash ..... | Alcohol.  |                | Tannin..... | Total Acid as Tartaric. |                             | Body ..... | Ash ..... | Sugar..... |
|                |                                     |                      |       |       |       |                                |                         |                        |           | By Weight | By Volume..... |             | At Pressing .....       | At Six to Eight Months..... |            |           |            |
|                |                                     |                      |       |       |       |                                |                         |                        |           |           |                |             |                         |                             |            |           |            |
| 1885—No. 399.  | R. C. Stiller, Guberville*          | Sept. 21             | 21.49 | 22.67 | 23.50 | 13.08                          | 16.10                   | .17                    | .61       | 3.36      | .35            | 2-5         |                         |                             |            |           |            |
| No. 344.       | L. D. Combe, San José.....          | Sept. 21             | 24.95 | 20.46 | 21.50 | 8.84 11.00                     | .12                     | .85                    | 2.99      | .27       |                |             |                         |                             |            |           |            |
| No. 350.       | Wm. Pfeffer, Guberville .....       | Sept. 21             | 24.95 | 23.62 | 23.50 | 10.54 13.00                    | .10                     | .61                    | 2.69      | .29       |                |             |                         |                             |            |           |            |
| No. 356.       | Wm. Pfeffer, Guberville .....       | Sept. 26             | 22.15 | 23.62 | 22.15 | 8.13 10.17                     | {.18 } .18              | .73                    | 2.69      | .37       |                |             |                         |                             |            |           |            |
| 1886—No. 533.  | Wm. Pfeffer, Guberville .....       | Oct. 13              | 23.50 | 22.67 | 23.50 | +9.05 11.27                    | .19                     | .42                    | 2.32      |           |                |             |                         |                             |            |           |            |
| No. 527.       | C. Weller, Warm Springs .....       | Oct. 9               | 21.50 | 20.46 | 21.50 | +8.34 10.42                    | .21                     | .73                    |           |           |                |             |                         |                             |            |           |            |
| 1888—No. 909.  | J. T. Doyle, Cupertino .....        | Oct. 10              | 24.29 | 26.48 | 24.29 | +7.99 10.00                    |                         | .63                    | 2.42      |           |                |             |                         |                             |            |           |            |
| 1889—No. 1160. | J. T. Doyle, Cupertino .....        | Oct. 15              | 23.70 | 23.62 | 23.70 | 9.20 11.45                     | .195                    | .51                    | 2.35      |           |                |             |                         |                             |            |           |            |
| No. 1185.      | J. Gallegos, Mission San José ..... | Oct. 15              | 55.50 | 23.62 | 55.50 | 9.92 12.36                     | .214                    | .50                    | 2.55      |           |                |             |                         |                             |            |           |            |
| 1890—No. 1428. | J. Gallegos, Mission San José ..... | Oct. 28              | 24.45 | 23.62 | 24.45 |                                |                         |                        |           |           |                |             |                         |                             |            |           |            |
| No. 1284.      | J. T. Doyle, Cupertino .....        | Oct. 1               | 21.50 | 23.33 | 21.50 |                                |                         |                        | No wine.  |           |                |             |                         |                             |            |           |            |
| No. 1230.      | Margherita Vineyard, Fresno.....    | Aug. 23              | 27.45 | 23.33 | 27.45 |                                |                         |                        |           |           |                |             |                         |                             |            |           |            |

\* Wine sent for examination. † December, 1886. ‡ June, 1887. § (1). || (2).

PFEFFER'S CABERNET (Robin Noir?).



## COLOR READINGS.

| PFEFFER'S CABERNET<br>(Robin Noir?). | 1886.                                      |                            | 1888.                     | 1889.              |
|--------------------------------------|--------------------------------------------|----------------------------|---------------------------|--------------------|
|                                      | C. Weller,<br>Warm Springs,<br>Alameda Co. | Wm. Pfeffer,<br>Gubsville. | John T. Doyle, Cupertino. |                    |
|                                      | No. 527.                                   | No. 533.                   | No. 909.                  | No. 1160.          |
| Must .....                           | Pale rose.                                 | Rose.                      |                           |                    |
| At pressing { Date .....             | Oct. 20.                                   | Oct. 25.                   | Oct. 16.                  | Oct. 15.           |
| One month { Color .....              | 16.3 4 V. R.                               | 11.6 R.                    | 16.0 R.                   | 21.2 5 V. R.       |
| Two months .....                     | 9.9 1 R.                                   | 13.0 1 R.                  | 12.1 4 R.                 | 7.4 1 V. R.+2 Y.   |
| Three months .....                   | 8.2 2 R.                                   | 13.0 1 R.                  | 11.4 3 R.                 | 6.5 4 V. R. 1 Y.   |
| Four months .....                    |                                            |                            | 10.5 3 R.                 | 6.2 R.+1 Y.        |
| Five months .....                    | 7.1 3-4 R.                                 | 11.2 2 R.                  | 11.7 3 R.                 | 6.1 4-5 V. R.+1 Y. |
| Six months .....                     | 7.1 3-4 R.                                 | 8.0 3 R.                   |                           | 5.5 4 V. R. 1 Y.   |
| Seven months .....                   |                                            |                            | 7.5 1R.+1 Y.              |                    |

*No. 909. Pfeffer's Cabernet (Robin Noir?).* From J. T. Doyle, Experimental Plot, Cupertino. Grapes arrived on October 12, 1888, in good condition, and were crushed the same day. Bunches of medium length, shouldered and compact, especially toward the lower part of the bunch. Many contain raisins; stems commencing to dry; very little coulure. The juice showed 24.29 per cent of solid contents. Fermentation of 125 pounds crushed began on the morning of October 14th, and reached its maximum of 92° the following morning. The murk was drawn off October 16th. The yield from the above amount was 10½ gallons, corresponding to 170 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. October 31. Racked; wine clean and sound.

December 2. Taken to cellar.

1889. January 9. Condition clear, with a quite well-developed bouquet; not very dark in color, with medium acid, and apparently sound, although in after-taste there is a faint suspicion of lactic acid; astringency medium high; alcohol medium.

January 12. "Undoubtedly makes a very useful foundation, to be given color and astringency by blending with Gamay Teinturier." (E. W. H. and F. P.)

March 28. The sediment shows, upon microscopical examination, considerable lactic ferment.

May 15. Racked; wine clear.

August 19. Condition bright, with a good red, not dark color; a special and agreeable bouquet, marked and agreeable flavor, clean taste, medium body, full acid, medium astringency, full alcoholic strength, quality good, stands dilution well.

November 4. Sample in half-gallon demijohn. Quality fair; tastes like cloves; racked the wine.

1890. February 10. Sediment shows no unsound germs.

February 17. A bright wine, with a pleasant and peculiar aroma, not very different from the Cabernets; taste clean, but has lost in bouquet.

February 26. Racked, and some bottled.

July 15. Lees show acetic ferment.

July 23. Much deteriorated, thin, and acetic.

August 13. Bottled.

1891. February 26. Wine bottled May 15, 1889, clear, with heavy deposit in bottle; tastes rank. Wine bottled March 10, 1890, bright, no deposit in bottle; light bouquet and full flavor; tastes clean and perfectly free from bad acids; quality very good. Wine bottled August 13, 1890, quite spoiled by acetic taint.

*No. 1185. Pfeffer's Cabernet (Robin Noir?).* From J. Gallegos, Mission San José. Only a few bunches were received of this variety, which corresponds well with Pulliat's description. Condition poor; grapes overripe, but not dried up. The juice showed 25.50 per cent of solid contents.

No. 1160. *Pfeffer's Cabernet (Robin Noir?)*. From J. T. Doyle, Cupertino. Grapes arrived October 10, 1889, and were crushed the same day. Juice showed 23.70 per cent of solid contents. The grapes were in good condition and ripe, bunches of good size, compact, and elongated, cylindrical sometimes, with a small shoulder; grapes small and round when not too close, skin rather thick and tough, stems slender, pedicels rather short and slender, flesh rather firm. Fermentation started October 11th, and reached its maximum of 89° October 13th. The murk was drawn off October 14th, four days from crushing, being still a little sweet. From 112.5 pounds crushed 9.37 gallons were obtained, corresponding to 163.33 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. November 19. Racked; not quite clear, and of a light and yellowish color; medium acid; high astringency, and high alcoholic strength; wine too young to judge of flavor.

1890. January 18. Condition clear, with a marked and pleasing bouquet; agreeable flavor; clean and rounded taste; medium acid; full astringency and alcoholic strength, and medium body; quality rather good. Lees show no unsound germs.

April 30. Racked into a six-gallon keg and half-gallon demijohn; condition bright, wine sound.

May 20. Lees show some lactic germs.

June 9. Of full and pleasing but not delicate flavor; maturing well.

September 30. Bright, little bouquet, but clean tasting and mature.

1891. January 2. Still good, but has become slightly acetified.

January 6. Lees show mycoderma vini and aceti.

March 13. Bottled.

#### *Discussion of Results.*

In glancing at the above records it appears that the Pfeffer's Cabernet is an abundant bearer under the long-pruning system. In the year 1889, at the Cupertino Experimental Plot, the crop was at the rate of about 5.6 tons per acre; but the previous year, from young vines, it was only of about 2.4 tons per acre.

The grapes on the average reach readily 25 per cent of sugar, and show an adequate acidity.

Its wine contains about 12 per cent of alcohol by volume, and is of medium astringency and acidity, and of good body. It lacks color, however, and could therefore be usefully blended with some other variety, as, for instance, the Gamay Teinturier. The wine has shown itself to be a good keeper under ordinary conditions, but it is somewhat rank, and while having a slight Cabernet flavor, it is not as delicate as the latter; but on the whole its culture is recommendable in California, both because of its good production and for the making of second-class wines. In any case it is much preferable to the Chauché Noir.

#### CHAUCHÉ NOIR.

This variety, widely cultivated in the Poitou region, France, where it is known also under the name of Pinot du Poitou, has no relation at all with the Pinots; the same can be said for the Chauché Gris, known in the same region as Pinot Gris du Poitou. The Chauché Noir resembles much the Trousseau of Jura, but it is, however, easy to distinguish them. There are some differences in their leaves and bunches, and their productiveness is not the same, the Trousseau being a much better bearer than the Chauché Noir. The typical characters of this variety are the following:

Leaves medium size, downy on the lower surface, and rather deeply sinuate; bunches medium or below medium size, somewhat loose, conico-

cylindrical, a little shouldered; berries medium size, ellipsoidal in form; flesh juicy and sweet; skin rather firm but not very resistant, and of a black color, somewhat pruinose at the time of maturity, which occurs at the second period.

TABLE OF PRODUCTION.

| CHAUCHÉ NOIR.                                            | Number of Vines.. | Total Weight of Grapes, in lbs.... | Average per Vine, in lbs. .... | Date of Picking ... |
|----------------------------------------------------------|-------------------|------------------------------------|--------------------------------|---------------------|
| 1887—No. 693 (short-pruned). J. T. Doyle, Cupertino ...  | 20                | 40                                 | 2.00                           | Oct. 7              |
| No. 694 (long-pruned). J. T. Doyle, Cupertino ....       | 20                | 110                                | 5.50                           | Oct. 5              |
| 1888—No. 869 (short-pruned). J. T. Doyle, Cupertino .... | 20                | 53                                 | 2.65                           | Sept. 22            |
| No. 870 (long-pruned). J. T. Doyle, Cupertino ....       | 20                | 232                                | 11.60                          | Sept. 22            |

## ANALYSES OF WINES.

| CHAUCHÉ NOIR.                                             | MUST.                |       |       |     | WINE.     |                       |                        |                                |                |                 |             |                         |                     |            |           |
|-----------------------------------------------------------|----------------------|-------|-------|-----|-----------|-----------------------|------------------------|--------------------------------|----------------|-----------------|-------------|-------------------------|---------------------|------------|-----------|
|                                                           | Date of Picking..... |       |       |     | Ash ..... | Acid as Tartaric..... | Sugar by Copper Test.. | Solid Contents by Spindle..... | Alcohol        |                 | Tennin..... | Total Acid as Tartaric. | Volatile Acid ..... | Body ..... | Ash ..... |
|                                                           |                      |       |       |     |           |                       |                        |                                | By Volume..... | By Weight ..... |             |                         |                     |            |           |
|                                                           |                      |       |       |     |           |                       |                        |                                |                |                 |             |                         |                     |            |           |
| 1883—No. 95. W. G. Klee, Glenwood.....                    | Oct. 7               | 20.78 | 20.99 | .58 | .37       | 9.34                  | .025                   | .40                            | .53            | 2.05            |             |                         |                     |            | 27        |
| 1886—No. 496. John Gallegos, Mission San José.....        | Sept. 24             | 20.40 | 19.89 | .35 | .45       | 9.92                  | .074                   | .41                            | .59            | 2.60            |             |                         |                     |            |           |
| No. 503. J. T. Doyle, Cupertino .....                     | Sept. 27             | 22.20 | 21.38 | .55 | .42       | 8.48                  | .106                   | .38                            |                | 2.42            |             |                         |                     |            |           |
| 1887—No. 693. J. T. Doyle, Cupertino .....                | Oct. 7               | 28.13 | 28.40 | .45 | .38       | 11.62                 | .163                   | .42                            | .54            | 3.30            |             |                         |                     |            |           |
| 1888—No. 869 (short-pruned). J. T. Doyle, Cupertino ..... | Sept. 22             | 24.95 | 25.08 | .37 | .43       | 10.26                 | .163                   | .31                            | .47            | 2.80            |             |                         |                     |            |           |
| No. 870 (long-pruned). J. T. Doyle, Cupertino .....       | Sept. 22             | 25.15 | 26.00 | .32 | .38       | 12.23                 | .143                   | .36                            | .41            | 3.57            |             |                         |                     |            |           |
| 1889—No. 1087. John Gallegos, Mission San José.....       | Sept. 13             | 23.35 | 23.62 | .59 | .40       | 10.81                 | .143                   | .36                            | .32            | 2.45            |             |                         |                     |            |           |
| 1890—No. 1298. John Gallegos, Mission San José.....       | Oct. 5               | 23.60 | ----- | .53 | .39       | -----                 | -----                  | -----                          |                |                 |             |                         |                     |            |           |
| No. 1290. J. T. Doyle, Cupertino .....                    | Sept. 27             | 23.00 | ----- | .55 | .-----    | -----                 | -----                  | -----                          | No wine.       |                 |             |                         |                     |            |           |
| No. 1227. Margherita Vineyard, Fresno.....                | Aug. 23              | 28.40 | 28.62 | .34 | .59       | -----                 | -----                  | -----                          |                |                 |             |                         |                     |            |           |

## COLOR READINGS.

| CHAUCHÉ NOIR.                                                                                                                                                         | 1886.                          |           | 1887.                   |                         | 1888.                  |                 | 1889.                                             |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------|-------------------------|-------------------------|------------------------|-----------------|---------------------------------------------------|--|
|                                                                                                                                                                       | J. Gallegos, Mission San José. |           | J. T. Doyle, Cupertino. |                         |                        |                 | J. Gallegos, Experimental Plot, Mission San José. |  |
|                                                                                                                                                                       | No. 496.                       | No. 503.  | No. 693.                | No. 869 (short-pruned). | No. 870 (long-pruned). |                 |                                                   |  |
| Must.<br>At pressing { Date<br>{ Color<br>One month.<br>Two months.<br>Three months.<br>Four months.<br>Five months.<br>Six months.<br>Seven months.<br>Eight months. | Pale rose.                     | Brownish. |                         |                         |                        |                 |                                                   |  |
|                                                                                                                                                                       | Oct. 4.                        | Oct. 7.   | Oct. 14.                | Oct. 12.                | Oct. 3.                | Sept. 24.       |                                                   |  |
|                                                                                                                                                                       | 10.2 1 R.                      | 5.0 2 R.  | 10.0 3 R.               | 10.4 1 R.               | 8.9 1 R.               | 10.0 2 V.+1 Y.  |                                                   |  |
|                                                                                                                                                                       | 10.1 1 R.                      | Orange.   | 6.6 O. R.               | 6.6 1 R.+1 Y.           | 8.9 3 V.R.+1 Y.        | 8.5 2 V.R.+1 Y. |                                                   |  |
|                                                                                                                                                                       | 5.3 2 R.                       | Orange.   |                         | 5.3 2 R.+1 Y.           | 5.4 5 V.R.+1 Y.        |                 |                                                   |  |
|                                                                                                                                                                       |                                |           | 7.1 3 R.                | 5.3 2 R.+1 Y.           | 6.2 4 V.R.+2 Y.        | 7.7 4 V.R.+1 Y. |                                                   |  |
|                                                                                                                                                                       |                                |           |                         |                         |                        | 7.6 5 V.R.+1 Y. |                                                   |  |
|                                                                                                                                                                       |                                |           | 6.0 4 R.                | 6.1 1 V.R.+2 Y.         |                        | 7.0 5 V.R.+1 Y. |                                                   |  |
|                                                                                                                                                                       |                                |           |                         |                         |                        | 7.4 3 V.R.      |                                                   |  |
|                                                                                                                                                                       |                                |           |                         |                         |                        |                 |                                                   |  |

**No. 693. *Chauché Noir*.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived November 6, 1887, and were crushed the same day. Their condition was good, very ripe. Bunches looser than usual, from coulure, which may be from 10 to 15 per cent. Comparison with No. 694, *Chauché Gris*, shows no perceptible difference in form of berries, branches, or seed; but the "Noir" has more dried berries, and somewhat more coulure, than the "Gris." The grapes showed 28.13 per cent of solid contents. Fermentation of 110 pounds crushed began on the morning of October 7th, and reached its maximum of 90° on October 14th; nine days from crushing it was drawn off. The yield from the above amount was  $8\frac{1}{8}$  gallons, or at the rate of 148 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 6.* Racked the young wine.

*December 19.* Condition slightly turbid, with an agreeable and well-advanced bouquet, acid pleasant, but a little low, and low astringency; on the whole a pleasant, well-advanced, and clean-tasted wine.

*1888. February 9.* Condition bright, with light acid, medium-heavy body, fairly developed bouquet; a pleasant, smooth wine, but not of high merit.

*May 3.* A microscopical examination of the sediment shows traces of lactic germs. Racked and pasteurized the wine.

*May 8.* Well-developed and agreeable bouquet, fruity flavor, moderate but adequate astringency; a pleasant, well-proportioned wine, that might pass unblended.

**No. 869 (short-pruned). *Chauché Noir*.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived in good condition, and were worked on September 28, 1888. The juice showed 24.95 per cent of solid contents. Berries just ripe, a few dried and sunburnt; bunches loose and uneven in size; early coulure abundant, and more than in the case of long-pruned; stems green. Fermentation of 34 pounds crushed began on the afternoon of September 29th (temperature of hot-box 94°, where it was put for one day to start the fermentation), and reached its maximum of 89° (room at 79°). On October 2d, four days from crushing, the murk was drawn off. The yield of the above amount was  $2\frac{3}{8}$  gallons, or at the rate of 154.4 gallons per ton.

**No. 870 (long-pruned). *Chauché Noir*.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived and were worked on September 28, 1888. Condition good; stems green; bunches much more typical than from short-pruned vines; ripeness uneven, some bunches being very sweet, others slightly sour; berries oval-shaped; bloom good; very few dried. Juice showed 25.15 per cent of solid contents. Fermentation of 188 pounds crushed began on September 29th, and reached its maximum of 96° on October 1st. On October 3d, five days from crushing, the murk was drawn off. The yield from the above amount was  $16\frac{1}{2}$  gallons, corresponding to 171.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. **No. 869.** *November 2.* Action ceased, taken to cellar.

**No. 870.** *October 25.* No action, but not clear enough for racking; placed in the cellar.

*December 5.* Racked; condition not very clear. Lees examined and shows lactic germs for both.

**No. 869.** *December 7.* Pasteurized.

*1889. January 12.* "Flat wine; of little apparent use in general; good in the Santa Cruz Range." (E. W. H.)

*February 27.* Racked, and combined the samples, Nos. 869, 870.

**Nos. 869, 870.** *August 3.* Condition bright; with a little yellowish color, no bouquet; a flat flavor and poor taste; medium acid and alcohol, and deficient astringency; quality poor.

*November 4.* Sample in demijohn not better than that in keg when last tasted.

*1890. February 6.* Lees show lactic germs. Condition clear, bouquet and flavor impaired by lactic taint; after-taste bitter; a thin wine of poor quality.

*February 27.* Racked again into a ten-gallon keg and one-gallon demijohn.

*July 27.* Lees sound.

*July 23.* Little changed in quality.

*1891. February 12.* Wine bottled in spring, 1889, spoiled.

The wine bottled on August 13, 1890, clear and rather good, but somewhat flat and exhausted.

*No. 1087. Chauché Noir.* From J. Gallegos, Experimental Plot, Mission San José. Rather close cylindrical, medium size bunches; grapes medium size and oval, skin thick but tender, flesh rather firm; condition fair, maturity advanced. The grapes arrived September 19, 1889, and were crushed the same day; juice showed 29.35 per cent of solid contents. Seventy-one pounds were crushed and fermentation commenced September 20th, rising to a maximum of 90° on September 22d and continuing till the 24th, when the murk was pressed, being nearly dry. The yield from the above amount was 5.6 gallons, corresponding to 158.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 7.* Condition nearly clear, with an agreeable bouquet and flavor, a clean taste, low acid, high astringency, and good body; general quality good; racked and taken to cellar.

*1890. January 14.* Condition not quite clear, with a light color, suspicious bouquet, and a slightly bitter taste.

*January 15.* Lees upon examination showed no unsound germs.

*April 5.* Racked.

*May 14.* Lees show a considerable amount of short lactic filaments.

*May 22.* Condition cloudy; flavor affected by lactic taint; pasteurized.

*September 11.* Clear, but not improved; racked.

*1891. January 7.* Bright; much of the lactic taint has gone, but the wine remains insipid and exhausted.

*February 18.* Wine bottled on May 22, 1890, differs little from that in the keg.

### *Discussion of Results.*

From the above records it appears that the Chauché Noir is a rather good bearer when pruned long, while it is a very poor one under the short-pruning system.

Leaving out of discussion the products from young vines and those received overripe, we may say that the grapes reach from 25 to 26 per cent of sugar, but have a rather low acidity even under the long-pruning system. It seems that when the grapes are left on the vine they keep fairly well and reach, even in the climate of the coast region, a high percentage of sugar, which renders them suitable for the making of sweet wines; but for this purpose they should not be used alone, for they lack certain qualities that are required in such a type of wine; but they should be used only in small quantity as a blending ingredient, with proper varieties.

The Chauché Noir worked into dry wine is very alcoholic and heavy-bodied, but in general lacks in tannin, in acidity, and in color; besides, it is a very poor keeper; and on the whole we do not think that, on account of the above-mentioned defects, its culture should be specially recommended in California.

### 3. NORTH ITALIAN TYPE.

In considering this type we do not intend to include all the grape varieties grown in northern Italy, but only some of them, and especially the Piedmontese varieties, which are already known in California.

It seems that the only Italian wine grape that came with the early importations was the one now generally known as "Crabb's Black Bur-

gundy," that compared with the Refosco imported later, and seems to agree rather well with it. It is remarkable for its deep color and good proportion of acid and tannin, qualities in which the true Burgundies are notably deficient.

The next importation of Italian grapes was made early in the eighties by John T. Doyle, Esq., who obtained small numbers of cuttings, and partly rooted and partly grafted them in his vineyards at Menlo Park and Cupertino. Among his earliest importations were the Nebbiolo and the Barbera, which hold in northern Italy the place that the Cabernets hold in the Bordeaux region; the Fresa, a strong and heavy bearer, and much used for blending purposes. By later importations Mr. Doyle brought several other valuable Italian varieties, both red and white, such as the Bonarda, Proviné, Moretto, Spanna, Aleatico, Moscatello Fino, Barbarossa, Marzemino, Vernaccia, Malvasia Bianca, Luglienga, Moscato Bianco, and Pizzutello. They were grown at the Experimental Plot at Cupertino with many other foreign varieties.

Other importations made by the Italian-Swiss Agricultural Colony, Asti, Sonoma County, Cal., brought many cuttings of the leading Piedmontese varieties, such as the Barbera, Bonarda, Nebbiolo, Grignolino, Dolcetto, and Fresa, that now are growing to a certain extent in the large vineyard of the colony, and are, together with some of the best French and Spanish varieties, taking the place that at first was reserved to the Zinfandel, as has been the case in most California vineyards. The same colony is now arranging for the importation of a large number of cuttings of those varieties suitable to production of the Italian wines of universal reputation, such as the Marsala of Sicily, the Chianti of Tuscany, etc.

But an important collection of valuable Italian grape varieties was imported last year by this Station through the kindness of Count G. di Rovasenda, of Turin, the well-known Italian ampelographer. All these varieties are being propagated, and will, as soon as possible, be distributed among the vine-growers of California.

The peculiarities that make these grapes very valuable for culture in California, whose climate is so similar to that of Italy, is their remarkably high acidity conjointly with a good proportion of sugar; they are likely also to reach an unusually high percentage of sugar while still maintaining a good proportion of acidity. Besides, they are quite astringent, and yield wines of deep color. In general they produce wines which are in large demand, both in Italian and foreign markets, on account of their remarkably good keeping qualities, their deep color, very pronounced vinosity, and agreeable acidity; by aging, their astringency is reduced, and then they are very delicate, and can be considered as first-class dry wines, of as good quality as those of the Bordeaux type. Some of them are also well adapted for the making of white wine, sweet or fortified, and for sparkling wines. The results obtained in Italy with these grapes have been in every respect very satisfactory.

Our experiments in the culture and the vinification of these grapes have confirmed the opinion that among them we have a group which may be relied upon for the making of good dry wines of excellent keeping qualities, under climatic conditions in which those of more northerly origin lose character, and fail as dry-wine grapes. In this respect one of the most important is the Barbera. It may also be said that they are good bearers, with the exception of the Nebbiolo, the wine of which,



however, is of such high value that it will compensate for the smallness of the crop.

The detailed record of our experiments for the grapes of this type is given in the following report. We hope that California vine-growers will give some attention to it, for these grapes undoubtedly represent a valuable ingredient in the future of the California wine industry, and should replace extensively a number of inferior varieties now in our vineyards:

## VINES OF NORTHERN ITALY.

*Observations and Data Regarding the Grape Crop on the Experimental Plot at Cupertino, 1887, 1888, and 1889.*

1887.

| NUMBER OF ROW .... | VARIETY.                               | LOCALITY.                        | OBSERVATIONS MADE JULY 23, 1887.                                                                                                                                                                          | OBSERVATIONS MADE AT TIME OF PICKING, OCTOBER 5-27, 1887.                           | NUMBER OF VINES .. | TOTAL WEIGHT ..... | AVERAGE PER VINE. | DATE OF PICKING .... |
|--------------------|----------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------|--------------------|-------------------|----------------------|
| 1                  | Nebbiolo Bourgu.<br>Nebbiolo Fino..... | Cupertino.....<br>Cupertino..... | Long-pruned. Crop light; no coulure; little second crop.<br>Short-pruned. Practically no crop.                                                                                                            | Only about twelve pounds of grapes picked.                                          | 20<br>20           | -----<br>-----     | -----<br>-----    | Oct. 25.             |
| 2                  | Fresa.....                             | Cupertino.....                   | Long-pruned. Fair crop; some coulure on second bud canes; sometimes total; in bloom; average 25 per cent; some second crop. Very little crop; Short-pruned. Very little crop; some second; heavy coulure. | Crop suffered very much from coulure.                                               | 20                 | 200                | 10.00             | Oct. 14.             |
| 38                 | Barbera .....                          | Cupertino.....                   | Long-pruned. Shy bearer; much coulure; much second crop.                                                                                                                                                  | Crop suffered very much from drying up of berries before ripening and from coulure. | 20<br>20           | 226<br>52          | 11.30<br>2.60     | Oct. 27.<br>Oct. 27. |
| 31                 | Moscátello Fino.....                   | Cupertino.....                   | Long-pruned .....                                                                                                                                                                                         | -----                                                                               | 20                 | 10                 | 0.50              | Oct. 27.             |
| 8                  | Cr. Bl. Burgundy.....                  | Cupertino.....                   | Long-pruned. Fair crop; coulure 25 per cent.<br>Short-pruned. Small crop; coulure 25 per cent.                                                                                                            | Crop suffered considerably from coulure, and to a less degree from over-ripeness.   | 20<br>20           | 110<br>15          | 5.50<br>.75       | Oct. 13.<br>Oct. 19. |

## NORTH ITALIAN TYPE.

| NUMBER OF ROW .... | VARIETY.             | LOCALITY,      | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888.                                                                                                                                                                                   | OBSERVATIONS MADE BY L. E.<br>BENTON AT TIME OF PICKING.                                                                                                                                                                                                                                                      | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE. | DATE OF PICKING ... |
|--------------------|----------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------|---------------------|
| 1                  | Nebbiolo Fino.....   | Cupertino..... | Pruned half-long; two canes.<br>Crop quite light; little cou-<br>lure at bloom; bunches near<br>ground ripening fast; con-<br>siderable second crop; needs<br>more wood.                                                                | Riper in pulp than Nebbiolo<br>Bourgu, but less sugar; crop<br>not heavy, reduced by rob-<br>bing. As much as 50 per<br>cent of early coulure, and<br>some burning of bunches at<br>bloom. Berries, although<br>ripe, have a purplish trans-<br>lucency; vines have made<br>good growth; some second<br>crop. | 16                 | 60                              | 3.75              | Oct. 23.            |
| 68                 | Nebbiolo Bourgu..... | Cupertino..... | Has no more crop than the<br>Nebbiolo Fino; some strong<br>vines none, but a little second<br>crop.                                                                                                                                     | This variety is bearing a little<br>better than Nebbiolo Fino;<br>there is less coulure; bunches<br>are larger, in other respects<br>very similar.                                                                                                                                                            | 13                 | 40                              | 3.07              | Oct. 23.            |
| 2                  | Fresa.....           | Cupertino..... | Pruned half-long; two canes;<br>fair but not heavy crop; also<br>some second crop; a little<br>early coulure (15 per cent).<br>Enormous growth of cane<br>like Palomino; should have<br>more wood left; seems to be<br>maturing evenly. | Bearing poorly; the trouble<br>seems to be the burning of<br>the bunch at bloom;<br>bunches uneven, due to<br>early coulure; a fine growth<br>of vines; but little second<br>crop.                                                                                                                            | 16                 | 50                              | 3.11              | Oct. 18.            |
| 69                 | Fresa.....           | Cupertino..... | Long-pruned .....                                                                                                                                                                                                                       | Bearing well; no second crop;<br>coulure as above.                                                                                                                                                                                                                                                            | 20                 | 236                             | 14.75             | Oct. 18.            |

## VINES OF NORTHERN ITALY—Continued.

1888.

| NUMBER OF ROW... | VARIETY.                                           | LOCALITY.      | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888.                                                                                                                               | OBSERVATIONS MADE BY L. E.<br>BENTON AT TIME OF PICKING.                                                                                                                                                                                 | NUMBER OF VINES. | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE. | DATE OF PICKING ... |
|------------------|----------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------|-------------------|---------------------|
| 38               | Barbera.....                                       | Cupertino..... | Long-pruned. Much second crop in spite of long-pruning; immense grower; good crop on some vines, nothing on others; total quite unsatisfactory; not as good as at Mission San José. | No crop to speak of, only two vines bearing, respectively. Bunches small, greatly reduced by early and late coulure; as much second crop as first; coulure equal on both; berries of all sizes; Vine of moderate growth; leaves falling. | 19               | 50                              | 2.63              | Oct. 22.            |
| 31               | Moscatoello Fino.....                              | Cupertino..... | Short-pruned. Black Muscat. Bloomed heavily, but had much coulure shortly after bloom; has some second crop; berries only partly turned color as yet.                               | Good crop; not picked.....                                                                                                                                                                                                               |                  |                                 |                   |                     |
| 102              | Bonarda.....                                       | Cupertino..... |                                                                                                                                                                                     | In very bad condition because of its leaves falling; at least half of these are lost, only those on younger shoots and spurs remaining.                                                                                                  | 4                | 14                              | 3.50              | Sept. 11.           |
| 28               | Corba Barba Gelata.....<br>(Bonarda di Gattinara.) | Cupertino..... |                                                                                                                                                                                     | Like Nebbiolo in translucent purple berry; and like Nebbiolo No. 2 in shape of berry and pubescence and shape of leaf; it differs in bunch, in pedicels and dotting.                                                                     | 6                | 23                              | 3.83              | Sept. 11.           |
| 95               | Provinante? (Pruiné).....                          | Cupertino..... |                                                                                                                                                                                     |                                                                                                                                                                                                                                          | 14               | 28                              | 2.00              | Sept. 11.           |

|    |                        |                 |                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                               |    |     |       |          |
|----|------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|----------|
| 8  | Cr. Bl. Burgundy ----- | Cupertino ----- | Short-pruned. Three spurs; had a heavy bloom, but was much coultured in full bloom; hence, first crop scarce; second crop abundant; coulture looks as though caused by frost; leaves also dead on blackened twigs in many places; berries mostly turned dark; second crop quite small yet. | Practically no crop; no second crop; rank growth of vines.                                                                                                                                                                                                                                    | 16 | 15  | .93   | Oct. 10. |
| 75 | Cr. Bl. Burgundy ----- | Cupertino ----- | -----                                                                                                                                                                                                                                                                                      | Long-pruned. Bunches variable, some compact, others loose from the great amount of early coulture; many bunches entirely destroyed in early bloom; best bunches near the ground; poorest, twelve to twenty inches up; no second crop; good growth of vines; tendency to bear at end of canes. | 15 | 170 | 11.73 | Oct. 10. |

## VINES OF NORTHERN ITALY—Continued.

1889.

| NUMBER OF ROW ... | VARIETY.             | LOCALITY.                         | NOTES TAKEN BY MR. KLEE, THE MIDDLE OF JULY, 1889.                               | OBSERVATIONS MADE AT TIME OF VINTAGE.                                                                                                                                                                                      | NUMBER OF VINES... | TOTAL WEIGHT, IN POUNDS..... | AVERAGE PER VINE, IN POUNDS..... | DATE OF PICKING.... |
|-------------------|----------------------|-----------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------|----------------------------------|---------------------|
| -----             | Nebbiolo No. 2 ..... | Cupertino.....                    | -----                                                                            | Berries rather small and without the flavor of the Nebbiolo.                                                                                                                                                               | -----              | -----                        | -----                            | -----               |
| -----             | Barbera .....        | Mission San José (Prof. Hilgard.) | -----                                                                            | Rather smaller and more oval than Pulliat's description; condition very good; maturity irregular; some bunches quite ripe, and others still tasting green; some bunches of second crop seem to have been picked with them. | -----              | 843¾                         | -----                            | Sept. 15.           |
| 38                | Barbera .....        | Cupertino.....                    | Long-pruned. Two vines pruned long; good crop; rest small.                       | Vines strong; much second crop; vines variable, some losing leaves, others full green; a few vines bearing fine compact bunches, rest with bunch small, loose and straggling with both early and late coulure.             | 20                 | 210                          | 15.50                            | Oct. 2.             |
| 2                 | Fresa.....           | Cupertino.....                    | Long-pruned. Fair; coulure. Short-pruned. Four to five eyes; fair, some coulure. | Spur-pruned making too much wood; much second crop; bunches loose, not much coulured; a little overripe at picking.                                                                                                        | 19                 | 120                          | 6.32                             | Oct. 3.             |
| 69                | Fresa.....           | Cupertino.....                    | Long-pruned. Fair; coulure. Short-pruned. Four to five eyes; fair, some coulure. | Vines and fruit in better condition than in row 2; good bunches; fair crop.                                                                                                                                                | 19                 | 150                          | 7.89                             | Oct. 2.             |

|     |                                               |                 |                                                  |                                                                                                                                                                 |    |     |       |         |
|-----|-----------------------------------------------|-----------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|---------|
| 121 | Spanna .....                                  | Cupertino ..... | Long-pruned. Good .....                          | Foliage burning and exposing fruit; bunch, rather loose and lax like Nebbiolo; very little coulure.                                                             | 6  | 90  | 15.00 | Oct. 9. |
| 68  | Nebbiolo Bourgu .....                         | Cupertino ..... | Long-pruned. Fair; some coulure; immense growth. | Essentially like Nebbiolo Fino in behavior; apparently a trifle better bearer and stronger grower.                                                              | 16 | 115 | 7.19  | Oct. 9. |
| 1   | Nebbiolo Fino .....                           | Cupertino ..... | Long-pruned. Good; some coulure.                 | Grows too fast; some second crop; foliage in perfect health; the few bunches mostly well filled and compact; a few coulured; in good condition for picking.     | 18 | 100 | 5.55  | Oct. 9. |
| 102 | Bonarda .....                                 | Cupertino ..... | Young grafts .....                               | Making fine growth; no fruit.                                                                                                                                   |    |     |       |         |
| 28  | Corba Barba Gelata<br>(Bonarda di Gattinara.) | Cupertino ..... | Long-pruned. Good .....                          | Good crop on long-pruned vines; a fine grower, and in perfect foliage; bunch medium, and very compact; over-ripe at time of picking.                            | 11 | 200 | 18.18 | Oct. 8. |
| 95  | Provinante? (Pruiné) .....                    | Cupertino ..... |                                                  | The few older vines long-pruned, and with light crop; a few with habit of Nebbiolo; bunches long and loose, often without shoulders; berries resemble Nebbiolo. | 4  | 20  | 5.00  | Oct. 9. |
| 51  | Moscchetto Fino .....                         | Cupertino ..... | Short-pruned. Much coulure.                      | Good crop; making better wood than last year; a little second crop.                                                                                             |    |     |       |         |

## VINES OF NORTHERN ITALY—Continued.

1889.

| NUMBER OF ROW.... | VARIETY.               | LOCALITY.          | NOTES TAKEN BY MR. KLEB, THE<br>MIDDLE OF JULY, 1889.                              | OBSERVATIONS MADE AT TIME OF<br>VINTAGE.                                                                                                    | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING... |
|-------------------|------------------------|--------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|--------------------|
| 37                | Marzemino.....         | Cupertino.....     | Vine too young to judge.....                                                       | A strong-growing variety,<br>with foliage of St. Macaire<br>type; bunch much should-<br>ered, and loose; without<br>couleure.               | 5                  | 30                              | 6.00                                | Oct. 9.            |
| 12                | Cr. Bl. Burgundy ..... | Cupertino.....     | Half-long; rather light; much<br>couleure where foliage is light;<br>has improved. | A good crop; no second crop;<br>bunches average fair, occa-<br>sionally couleured at picking.                                               |                    |                                 |                                     | Sept 30.           |
| 8 & 75            | Cr. Bl. Burgundy ..... | Cupertino.....     | Long-pruned. Fair; couleure<br>where too thick.                                    | Luxuriant growth; some<br>second crop; bunches gen-<br>erally good, but occasion-<br>ally couleured; does not burn<br>easily when exposed.  | 39                 | 500                             | 12.82                               | Oct. 1.            |
|                   | Refosco .....          | Mission San José.. | Short-pruned. Larger berries<br>than Cr. Bl. Burgundy; small<br>crop.              | Cr. Bl. Burgundy without ques-<br>tion.                                                                                                     |                    |                                 |                                     |                    |
|                   | Refosco .....          | Cupertino.....     | Long-pruned. Good.....                                                             | Fair crop; ready grower, with<br>striking foliage; bunch<br>loose, the stems becoming<br>dark at maturity; much<br>early and late couleure. | 3                  | 45                              | 15.00                               | Oct. 2.            |



## NEBBIOLO (SPANNA OR SPANNA).

The Nebbiolo is one of the most anciently cultivated vines of Piedmont and northern Italy generally. Its name is due to the strikingly pruinose, or "nebulous," aspect of its berries at maturity. Its wines are esteemed to be of the highest excellence, provided perfect maturity of the grapes be reached. Many of the best Piedmontese wines owe their reputation to the Nebbiolo that enters into their composition, and are comparable, when well made, to the high-class Bordeaux wines.

The Nebbiolo is universally trained long, and even very long, this being apparently necessary on account of the fact that the lower five or six buds are generally infertile. The vine is stated to be very vigorous; its leaves have the peculiar bluish tint and roughish surface common to many of the older South Italian varieties, which, with more or less rigid leaf, renders them easy of recognition.

We find at Cupertino a modification of the Nebbiolo, which, according to the statement of Mr. Alexander Filipello, Mr. Doyle's foreman, is known to the Piedmontese as "Nebbiolo Bourgu," the adjective referring to the peculiar manner in which the canes fork near their extremities, the main shoot apparently dividing into two equal branches with, at times, a feeble direct shoot between. This Nebbiolo Bourgu has leaves much less deeply lobed than the simple Nebbiolo, and is a stronger grower and better bearer. The deeply cut variety, the Nebbiolo, pure and simple, contrasts quite strikingly with its more vigorous companion by a straggling and dusty aspect and sparse bearing. This difference corresponds to what is seen in seedling Zinfandels as compared with the typical variety, and is so great that one would hardly desire to propagate the scantily-clad vine at all.

Special inquiry was addressed to Count di Rovasenda, the Italian ampelographer, in regard to the Nebbiolo Bourgu. He answered that it is true that the Nebbiolo, in the neighborhood of Pinerolo, shows frequently the bifurcation of the canes, and therefore it is called Nebbiolo Bourgu, or Bourcu. He does not believe that it makes a distinct variety, but considers it as the result of both special climatic and soil conditions in which the vine grows. Nevertheless, the experimental culture at Cupertino has distinctly shown that the Nebbiolo Bourgu is a better bearer than the other Nebbiolo; the record for the latter showing for three years, in absolutely similar conditions, an average of only 5.1 pounds per vine, while that of the latter was 6.7, or at the rate of about  $2\frac{1}{4}$  tons per acre. The grapes imported under the name of Spanna resemble the "Bourgu."

*Description.*—Leaves rather under average size, of a dark grayish-green color, glabrous, and nearly smooth on the upper side, slightly villous on the lower side, somewhat rigid; lower sinus deep, quite round, and somewhat open; secondary sinus not very pronounced in the "Bourgu," quite deep in the "Fino;" petiolar sinus open; marginal teeth quite long, sharp, and finely pointed; petiole of average length, quite strong, finely hairy, and reddish. Canes of a uniform, seemingly dusty brown.

Bunches above the average size, conico-cylindrical, a little shouldered, almost compact; peduncle long and rather slender.

Berries average size, shortly ellipsoidal, well attached to the pedicel, which is quite long and rather slender; skin rather thin, quite resistant, of a reddish-violet color, tending to black; strongly pruinose at maturity,

which occurs in the second period; flesh juicy, slightly acid, quite sweet, and agreeable.

TABLE OF PRODUCTION.

| NEBBIOLO FINO AND NEBBIOLO BOURGU. |                                           | Number of Vines... | Total Weight of Grapes, in lbs.... | Average per Vine, in lbs. .... | Date of Picking... |
|------------------------------------|-------------------------------------------|--------------------|------------------------------------|--------------------------------|--------------------|
| Nebbiolo Fino—                     |                                           |                    |                                    |                                |                    |
| 1888—No. 933.                      | J. T. Doyle, Experimental Plot, Cupertino | 16                 | 60                                 | 3.75                           | Oct. 23            |
| 1889—No. 1163.                     | J. T. Doyle, Experimental Plot, Cupertino | 18                 | 100                                | 5.55                           | Oct. 9             |
| 1890—No. 1285.                     | J. T. Doyle, Experimental Plot, Cupertino | 20                 | 125                                | 6.20                           | Oct. 1             |
| Nebbiolo Bourgu—                   |                                           |                    |                                    |                                |                    |
| 1887—No. 779.                      | J. T. Doyle, Experimental Plot, Cupertino | 20                 |                                    |                                | Oct. 25            |
| 1888—No. 932.                      | J. T. Doyle, Experimental Plot, Cupertino | 13                 | 40                                 | 3.07                           | Oct. 23            |
| 1889—No. 1162.                     | J. T. Doyle, Experimental Plot, Cupertino | 16                 | 115                                | 7.20                           | Oct. 9             |
| 1890—No. 1364.                     | J. T. Doyle, Experimental Plot, Cupertino | 5                  | 50                                 | 10.00                          | Oct. 15            |

ANALYSES OF MUSTS AND WINES OF THE NEBBIOLO VARIETIES, GROWN BY J. T. DOYLE, AT THE EXPERIMENTAL PLOT, CUPERTINO.

|                                | MUST.                |                           |  |                       | WINE.           |                 |                             |                         |            |
|--------------------------------|----------------------|---------------------------|--|-----------------------|-----------------|-----------------|-----------------------------|-------------------------|------------|
|                                | Date of Picking..... |                           |  |                       | Alcohol.        |                 | Tannin.....                 | Total Acid as Tartaric. | Body ..... |
|                                |                      |                           |  |                       | By Weight ..... | By Volume ..... | At Six to Eight Months..... | At Pressing .....       |            |
|                                |                      |                           |  |                       |                 |                 |                             |                         |            |
|                                |                      |                           |  |                       |                 |                 |                             |                         |            |
| Solid Contents by Spindle..... |                      | Sugar by Copper Test..... |  | Acid as Tartaric..... |                 | Ash .....       |                             |                         |            |
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† June, 1887. † December, 1886.



*No. 779. Nebbiolo Bourgu.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 26, 1887, and were crushed the following day. Their condition was good; considerable coulure, say 30.0 to 50.0 per cent; just ripe; sweet and quite acid. Will make a good sample of wine, but not enough in quantity. The juice showed 26.25 per cent of solid contents; acid, .76 per cent. Only 17.5 pounds were received, consequently no wine was made.

*No. 932. Nebbiolo Bourgu.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived on October 24, 1888, and were crushed the same day. Their condition was excellent, very little coulure, and fully ripe; stems green, considerable bloom, a few bunches had some half-dried berries; bunches, when not broken, medium length and shouldered. Juice showed 26.82 per cent of solid contents. Fermentation of 40 pounds crushed, started October 25th, attained its maximum temperature of 87° on October 26th. On October 29th the wine was pressed. The yield from the above amount was 2½ gallons, corresponding to 125 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 14.* Racked; wine clear and sound, with undeveloped bouquet, rough and not pleasant taste. Lees contain no unsound germs.

1889. *April 3.* Racked again; a clear wine of good color, rough but pleasant taste, and advancing bouquet.

*April 6.* Lees show some lactic ferment; pasteurized.

*June 1.* Racked again; condition clear, but acid suspicious.

*August 7.* Condition bright; a good red color; marked and peculiar flavor and bouquet; agreeable taste; good body and quality; medium acid, full astringency and alcohol; stands dilution well.

*November 5.* Wine has lost its good quality since last tasting, and contracted a strong, moldy taste.

1891. *March 2.* Thick and spoiled.

*No. 933. Nebbiolo Fino.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 24, 1888, and were crushed the same day. Their condition was good, but more coulure than the Bourgu; also, more bunchy, with dried and half-dried berries; size of berry smaller than that of No. 932; stems green; bloom same on both. Juice showed 26 per cent of solid contents. Fermentation of 62 pounds crushed started October 25th, and reached its maximum of 93.5° on the following day. On the 29th it was pressed. The yield from the above amount was 4½ gallons, corresponding to 149.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 19.* Racked; action quiet; taken to cellar.

*December 19.* Racked again.

1889. *January 9.* Wine clear and light colored; a slightly developed bouquet and rough acid; body high; acid suspicious.

*January 12.* "High quality, but the sample is getting acetified." (E. W. H. and F. P.)

*January 15.* Pasteurized.

*February 27.* Racked again; sediment shows dead lactic germs.

*August 7.* Condition bright, with a good acid color, marked and agreeable bouquet, and special and very agreeable flavor; good body; medium acid; adequate astringency and alcohol; the quality is very good, and it stands dilution well.

*November 4.* (One-gallon demi-john.) Same observation in regard to taste as for keg sample. Racked into bottles.

1890. *February 11.* Lees sound.

*February 13.* Condition bright, with delicate bouquet, very agreeable and characteristic flavor and high quality. The wine is quite mature.

*March 10.* Racked.

1891. *March 2.* Condition bright; color not dark, but of sufficient color; delicate, characteristic, very agreeable bouquet and flavor; wine is remarkably mellow and smooth, though with quite sufficient tannin and acid; the general quality is high.

**No. 1161. Spanna.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 10, 1889, and were crushed the following day. Their condition was good, and maturity complete. Both leaves and grapes correspond to Pulliat's description of Nebbiolo, except that the grapes are a little smaller. It was indistinguishable from the Nebbiolo Bourgu received from Cupertino. Juice showed 21.50 per cent of solid contents. Fermentation of 58½ pounds crushed began October 12th and reached its maximum of 77° on October 13th. On October 15th, tasting dry, it was pressed. The yield from the above amount was 4½ gallons, corresponding to 158.1 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1889. October 30.** Condition not quite clear; clean taste, agreeable flavor, but too young to judge of; full acid, and rather low astringency.

**November 22.** Racked and taken to cellar.

**1890. January 22.** Condition clear, with light color, a marked and pleasing bouquet; full flavor and acid, medium astringency, high alcohol; of good quality, but rather rough. Lees sound.

**April 2.** Racked.

**June 13.** A clear wine, with faint bouquet and good flavor; general quality good. It is not distinguishable from No. 1162, Nebbiolo Bourgu.

**December 31.** Lees show "*pastorianus*" ferment.

**1891. January 7.** A bright wine, but slightly colored; it has a good and characteristic bouquet and flavor; full acid; general quality is good, but it has suffered from being in such small quantity.

**March 12.** Bottled the wine.

**No. 1162. Nebbiolo Bourgu.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 10, 1889, and were crushed the following day. Their condition was good. The grapes corresponded exactly to Pulliat's description of the Nebbiolo; maturity was complete. Juice showed 23.90 per cent of solid contents. Fermentation of 53 pounds commenced October 12th and reached its maximum of 83.5° on October 13th. On October 14th, the wine being dry, was pressed. The yield was 3½ gallons of wine, corresponding to 181 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1889. October 30.** Condition not quite clear, with clean taste, agreeable flavor, but covered by carbonic acid gas.

**December 12.** Racked and taken to cellar.

**1890. January 12.** A clear, sound wine of light color, with agreeable but not marked flavor and bouquet; clean taste and adequate acid; lees sound.

**April 2.** Racked.

**June 13.** Condition clear; faint bouquet, good flavor, but not so delicate as Nebbiolo Fino; acid good; high astringency; quality good.

**August 4.** Lees sound.

**December 31.** Lees show a large quantity of "*pastorianus*" ferment.

**1891. January 7.** A bright wine, with rather more bouquet than Nebbiolo Fino, otherwise corresponds to it.

**February 17.** Bottled the wine.

**No. 1163. Nebbiolo Fino.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 10, 1889, and were crushed the next day. Their condition was good. The only apparent difference between this and the Nebbiolo Bourgu and the Spanna is the greater compactness of its bunches. Their maturity was complete. Juice showed 22.80 per cent of solid contents. Fermentation of 53 pounds crushed started October 12th, and reached its maximum of 83° on October 13th. On October 14th it tasted dry, and therefore, on the next day, it was pressed. The yield from the above amount was 4½ gallons, corresponding to 162.7 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 30.* Condition is not quite clear, but with clean taste; the flavor is not different from Nos. 1161 and 1162 (Spanna and Nebbiolo Bourgu), and wine contains a large amount of carbonic acid gas. Racked and taken to the cellar.

1890. *January 18.* Condition clear, with very light color, marked and pleasing flavor and bouquet, smooth taste, medium acid and body, and adequate tannin and alcohol; a smoother and more advanced wine than either the Spanna or the Bourgu. Lees examined, and found to be sound.

*April 29.* Racked again; wine bright and sound.

*May 20.* Lees still sound.

*June 18.* Condition clear, with a more marked bouquet than Spanna and Nebbiolo Bourgu; full and fine flavor; good astringency and pleasing acid; altogether is a wine of high quality, but has very light color.

*August 4.* Lees show some bitter germs.

1891. *January 7.* Condition bright; very little color; less bouquet than Spanna, but more delicate and better flavored; less acid, and of better quality; quite mature.

*January 22.* Lees contain some lactic ferment.

*March 12.* Wine bottled April 29, 1890, equal to that in the keg, and quite sound. Wine from keg bottled at date.

Evidently a wine of high keeping qualities.

### *Discussion of Results.*

It is fair to say that the Nebbiolo, under its different names, has conserved in California all the qualities which characterize it in the Piedmontese regions. In regard to its productiveness, the results at the Cupertino Experimental Plot have shown it to be quite a poor bearer. There, in 1889, the crop of the Nebbiolo Fino was at the rate of about  $1\frac{3}{4}$  tons per acre, while its companions, the Nebbiolo Bourgu and the Spanna, had respectively  $2\frac{1}{2}$  tons and  $5\frac{1}{2}$  tons. However, this latter crop should be taken as abnormal, the crop of 1890 having been small. Altogether, the Spanna, as it occurs in Italy, may be considered as the strongest and best bearer of the Nebbiolo stock, but it always gives a smaller crop than all other Piedmontese varieties. Hence, the Nebbiolo is disappearing more and more every year from the vineyards of northern Italy, being replaced by the more productive varieties like Fresa, Barbera, and Bonarda, and only a few small vineyards of Nebbiolo are being kept by the noblemen as a luxury, on account of the excellent qualities of its wine.

The analytical results of its must and wine show that the sugar contents reached by both the Nebbiolo Bourgu and the Spanna was slightly higher than in the Nebbiolo Fino, except in the case of the 1888 vintage, at which we find the same amount of sugar in both.

As to the alcoholic strength, this variety makes a wine from 10 to 13 per cent of alcohol by volume.

As to acidity, the Nebbiolo Bourgu and the Spanna generally showed higher percentages than the Nebbiolo Fino; the same could be said in regard to the astringency; while higher color, as far as the table shows, seemed to be reached by the Nebbiolo Bourgu.

The wine of the Nebbiolo made at the Experimental Cellar confirms the reputation it has in its native country. Being quite rough at the beginning, like most of the Piedmontese wines, it improves more rapidly than other varieties, such as the Barbera or Fresa, and acquires all those qualities which remind us of the best Bordeaux wine. The Nebbiolo Bourgu and Spanna are not so delicate as the Nebbiolo Fino, but they require a little more time than the latter for aging. Altogether, they are high-class, heavy-bodied wines, of very good keeping qualities.

## BARBERA.

The Barbera is especially known as the grape which chiefly yields the red wines of Asti and Monferrato, Italy, but it is now quite extensively grown in northern and central Italy on account of its hardiness, its fertility, and the high quality of its product. It often bears heavily the third year, and this productiveness is maintained for many years. The Barbera is not choice in respect to the soil, but prefers a ferruginous clay and a warm east and south exposure. It is not easily hurt by frost, nor is it much subject to mildew. Being very vigorous it does well with short-pruning, being allowed more or less wood according to soil and vigor.

*Description.*—Leaves over the average size, rather deeply sinuous, rather thick, a little puckered but almost glabrous on upper side, and flocculent pubescent on the lower; teeth alternately large and small, rather obtuse; petiolar sinus closed.

Bunches over average size, a little branched, conico-cylindrical, somewhat loose.

Berries ellipsoidal and rather large; flesh somewhat firm and juicy; skin thickish, rather tough, bluish-black, and pruinose.

Maturity occurs in the third period in Italy; at Mission San José, second period, but can be left on the vine through the third period without injury, maintaining its acidity.

The canes of this variety are long and slender; and in strong soils, at least, seem ill-adapted to low short-pruning, as the branches would touch the ground. It should in such locations evidently be trained to stakes or trellises.

TABLE OF PRODUCTION.

| BARBERA.       |                                |  | Number of Vines.. | Total Weight of Grapes, in lbs. .. | Average per Vine, in lbs. .... | Date of Picking... |
|----------------|--------------------------------|--|-------------------|------------------------------------|--------------------------------|--------------------|
| 1887—No. 786.  | John T. Doyle, Cupertino ..... |  | 20                | 226                                | 11.30                          | Oct. 27            |
| 1888—No. 925.  | John T. Doyle, Cupertino ..... |  | 19                | 50                                 | 2.63                           | Oct. 22            |
| 1889—No. 1132. | John T. Doyle, Cupertino ..... |  | 20                | 210                                | 10.50                          | Oct. 2             |
| 1890—No. 1324. | John T. Doyle, Cupertino ..... |  | 5                 | 93.5                               | 18.70                          | Oct. 12            |





## COLOR READINGS.

| BARBERA FINA.       | 1896.                     |              | 1897.                            |              | 1898.                                      |               |
|---------------------|---------------------------|--------------|----------------------------------|--------------|--------------------------------------------|---------------|
|                     | John T. Doyle, Cupertino. |              | E. W. Hilgard, Mission San José. |              | J. T. Doyle, Experimental Plot, Cupertino. |               |
|                     | No. 517.                  | No. 786.     | No. 861.                         | No. 861a.    | No. 915.                                   | No. 925.      |
| Must                | Pale rose.                | Nov. 2       | Oct. 1                           | Oct. 2       | Oct. 22                                    | Oct. 27.      |
| At pressing { Date  | Oct. 4.                   |              |                                  |              |                                            |               |
| At pressing { Color | 67.1 1 V. R.              | 114.3 V. R.  | 61.5 2 V. R.                     | 79.9 2 V. R. | 86.9 1-2 V. R.                             | 111.1 2 V. R. |
| One month           | 35.7 2 V. R.              |              | 38.0 4 V. R.                     | 59.7 2 V. R. | 58.0 3 V. R.                               | 72.7 2 V. R.  |
| Two months          | 33.3 2 V. R.              | 95.2 1 V. R. |                                  |              | 47.0 3 V. R.                               | 62.5 2 V. R.  |
| Three months        |                           |              |                                  |              | 44.4 4 V. R.                               | 51.3 2 V. R.  |
| Four months         |                           |              |                                  |              | 38.0 4 V. R.                               | 50.0 2 V. R.  |
| Five months         |                           |              |                                  |              |                                            |               |
| Six months          | 25.7 1 V. R.              | 70.0 1 V. R. |                                  |              |                                            |               |
| Seven months        | 22.2 2 V. R.              |              |                                  |              |                                            |               |
| Eight months        |                           |              |                                  |              | 32.0 1 R.                                  | 40.0 3 V. R.  |

## COLOR READINGS—Continued.

| BARBERA FINA.                | 1889.                                  |                |                |                         |                |                     |
|------------------------------|----------------------------------------|----------------|----------------|-------------------------|----------------|---------------------|
|                              | Prof. E. W. Hilgard, Mission San José. |                |                | J. T. Doyle, Cupertino. |                |                     |
|                              | No. 1072.                              | No. 1072a.     | No. 1072b.     | No. 1072c.              | No. 1132.      | No. 1132a.          |
| Must . . . . .               | September 21.                          | September 20.  | October 19.    | October 21.             | October 7.     | Oct. 8 (on pomace). |
| At pressing { Date . . . . . | 80.0 1 V. R.                           | 74.1 2 V. R.   | 45.9 2+ V. R.  | 62.5 1 V. R.            | 70.0 1+ V. R.  | 68.0 1+ V. R.       |
| One month . . . . .          | 41.2 1 V. R.                           | 33.3 2+ V. R.  | 19.0 4 V. R.   | 42.0 2+ V. R.           | 43.4 1 V. R.   | 51.2 1 V. R.        |
| Two months . . . . .         | 22.2 4-5 V. R.                         | 15.4 4-5 V. R. | 18.1 4-5 V. R. | 31.3 1-2 V. R.          | 42.0 1 V. R.   | 37.7 1 V. R.        |
| Three months . . . . .       | 27.6 2 V. R.                           | 10.9 1 R.      | 16.0 4-5 V. R. | 25.3 1 V. R.            | 31.3 1 V. R.   | 25.3 2 V. R.        |
| Four months . . . . .        | 26.6 2 V. R.                           | 10.8 1 R.      | 16.0 4-5 V. R. | 25.3 1 V. R.            | 28.6 1-2 V. R. | 23.2 1-2 V. R.      |
| Five months . . . . .        | 26.5 1 V. R.                           | 11.5 R-1 R.    | 18.6 4-5 V. R. | 24.1 1 V. R.            | 27.6 1-2 V. R. | 23.2 1-2 V. R.      |
| Six months . . . . .         |                                        |                |                |                         |                |                     |
| Seven months . . . . .       | 26.0 1 V. R.                           | 11.5 R-1 R.    | 18.6 4-5 V. R. | 21.6 1 V. R.            | 17.4 3 V. R.   | 16.2 1-2 V. R.      |
| Eight months . . . . .       |                                        |                |                |                         |                |                     |

*No. 786. Barbera Fina.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 28, 1887, and were crushed the same day. The condition of the long-pruned sample was rather poor; on many bunches half of the berries were half-dried and mostly unripe, the full berries appearing overripe in most cases. There was considerable early coulure. Bunches large, loose, and none packed, as in sample from Mission San José; not very sweet to the taste, nor very acid. The short-pruned sample had very small bunches and berries; much coulured, but the general condition was better and more like a normal sample than the long-pruned; quite sweet, and also sufficiently acid. It looks like a second crop, or from the upper buds of the vine. The two lots fermented together will give some idea of the wine, but will hardly be a normal sample. The juice showed 23.56 per cent of solid contents. Fermentation of 168 pounds crushed began on October 29th, reached its maximum of 87° on October 30th, and remained at that point twenty-four hours. The murk was drawn off on November 2d, five days from crushing. The yield from the above amount was 13 $\frac{5}{16}$  gallons, or at the rate of 158 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *February 3.* Wine racked from the lees. *February 8.* Condition bright, with pronounced acid, marked astringency, and very heavy body; the wine is not very much advanced.

*June 20.* Condition bright, with deep color, pronounced development of bouquet, roughish and very high but not bitter astringency, heavy body, and sharpish acid in after-taste. The sediment shows, under the microscope, effete yeast, amorphous matter, and traces of lactic germs; racked and pasteurized the sample for safety.

*No. 861. Barbera.* From E. W. Hilgard, Mission San José. The grapes arrived September 25, 1888, and were crushed early the following day. Their condition was good and ripe; very little coulure. Juice showed 24.66 per cent of solid contents. Fermentation of 81 pounds crushed began September 27th, and reached its maximum of 90° on September 28th; on October 1st it was pressed. The yield from the above amount was 6 $\frac{1}{2}$  gallons, corresponding to 163.6 gallons per ton.

*No. 861a. Barbera.* From E. W. Hilgard, Mission San José. The grapes arrived September 27, 1888, and were crushed the following day. Their condition was very good, with the exception of a few moldy bunches. Juice showed 25.19 per cent of solid contents. Fermentation of 151 pounds crushed began on September 29th, and reached its maximum of 97° on the 30th, the temperature gradually falling to 83°. On October 3d the wine was pressed; 12 $\frac{1}{2}$  gallons were obtained, corresponding to 162 $\frac{1}{2}$  gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *October 29.* Action has ceased, but condition is not clear enough for racking; placed in the cellar.

*December 12.* Racked; condition clear; bouquet only slightly developed; color and taste characteristic; a faint trace of sugar remains, but will, no doubt, ferment out; acid fair; tannin adequate. Lees sound.

1889. *January 12.* "Grapes gathered too early, but wine fine nevertheless." (E. W. H. and F. P.)

*February 23.* Wine seemed of doubtful soundness, lees showing a small amount of lactic ferment; pasteurized.

*May 16.* Racked again; condition clear.

*August 7.* Condition bright; color good red, tending to violet; bouquet pleasant and marked; flavor smooth and agreeable; taste clean; body good; acid full; tannin and alcohol medium; quality good; stands 50 per cent dilution well.

*November 4.* (Sample in one-gallon demijohn.) Condition bright, with a good ruby color; marked and agreeable bouquet; well-developed flavor; smooth taste; good body; full astringency; the acid is lower than in the keg sample; medium alcohol, and of good quality, but a little exhausted.

1890. February 4. Lees sound.

February 26. Condition clear, with a bouquet and flavor as good as at last tasting (keg sample).

February 27. Racked again.

July 17. Lees sound; a bright wine with a good bouquet and full flavor, clean taste, good acid and astringency; general quality good, but a little exhausted.

August 11. Bottled the wine.

1891. February 12. Wine bottled May 16, 1889, is clear, has heavy deposit, not good bouquet, contains some bad acid germs, and was evidently bottled too soon. Wine bottled February 27, 1890, is clear and has no deposit; its bouquet is good and flavor full and agreeable; its acidity medium and astringency full; its general quality is high. It is the best of the three samples. Wine bottled August 11, 1890, is almost equal to No. 2, but with less bouquet.

No. 915. *Barbera*. From E. W. Hilgard, Mission San José. The grapes arrived October 18, 1888, and were crushed the same day. Their condition was fair but overripe; the berries somewhat flabby, some dried and half-dried; but only a few, and only those that were on the ground, were moldy or rotten, showing the *Barbera* to be very little liable to damage by the weather, as these grapes had been ripe on the vines since September 25th, at which time they were overlooked when the others were picked. Juice showed 26.95 per cent of solid contents. Fermentation of 32.5 pounds crushed started visibly on the afternoon of October 18th, and reached its maximum of 94° on the afternoon of the next day. On the 20th the temperature had fallen to 91° (room 95°), when it was removed to a room kept at 75°. On October 22d the temperature had fallen to 79°, when it was pressed. The yield from the above amount was 3½ gallons, corresponding to 147.62 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. November 10. Taken to cellar.

December 12. Racked; sediment shows no unsoundness. As compared with No. 861, it is better in bouquet and vinous flavor, being three weeks later; the tannin is about the same, but the acid seems more pleasant.

1889. January 12. "Grapes gathered too late, but the wine is fine nevertheless." (E. W. H. and F. P.)

March 29. Pasteurized for safety.

August 7. (Sample in glass.) Condition clear, with a good dark-red color, poor bouquet, suspicious and flat flavor and taste, full acid, good astringency, medium alcohol, and poor quality; it improves upon dilution.

November 4. Wine completely spoiled, and was discarded. It had doubtless originally been tainted by unsound grapes.

No. 925. *Barbera Fina*. From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 23, 1888, and were crushed the same day. Their condition was good. Early and late coulure had badly damaged the crop. Juice showed 25.39 per cent of solid contents. Fermentation of 50 pounds crushed started October 24th in a warm room at 80°, attained its maximum of 97° on October 25th, and then gradually fell to 83.5° on October 27th, when it was pressed. The yield from the above amount was 3½ gallons, corresponding to 155 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. November 28. Action almost ceased; taken to cellar.

December 11. Racked and pasteurized for safety, although the lees show no unhealthy germs, the sample being small. The condition is clear, with a bouquet well developed for its age; wine pleasant and sound.

1889. January 12. "Of the three samples from Cupertino this number is the best; grapes gathered just at the right time." (E. W. H. and F. P.)

February 28. Racked again; lees sound.

August 7. Condition bright, with a very dark red color, peculiar not agreeable bouquet, a flavor that seems rather too green, undeveloped taste, adequate acid, medium alcohol and astringency, and passable quality. It stands dilution well.

1890. February 10. Lees show lactic and some bitter ferments.

February 13. Condition clear, but bouquet and flavor spoiled by lactic ferment.

March 7. Racked.

July 18. Lees full of acetic ferment. The sample having a vinegar taste was discarded.

*No. 1072. Barbera.* From E. W. Hilgard, Mission San José. The grapes arrived September 17th in very good condition, no bad or dried grapes, and very few crushed. Their maturity was very irregular, some bunches being quite ripe and others still tasting green. There seemed to be a few bunches of the second crop. Grapes corresponded to Pulliat's description, except that they were in general rather smaller and more oval. They were crushed September 17th. The juice showed 24.35 per cent of solid contents. The grapes were divided into four parts for different methods of fermentation, called respectively 1072, 1072a, 1072b, 1072c.

*No. 1072* consisted of 272 pounds of grapes fermented with the outside temperature at 72°. Fermentation started September 18th, attained its maximum of 98° on September 20th, and on the next day, being dry, the grapes were pressed; the duration of fermentation was ninety-six hours. The yield from the above amount was  $24\frac{2}{3}$  gallons, corresponding to 180.6 gallons per ton.

*No. 1072a* consisted of 117½ pounds of grapes fermented with the outside temperature at 95°. Fermentation started September 18th at 79°, and attained its maximum of 100° on the next day. The wine was pressed on September 20th. The yield from the above amount was 10½ gallons, corresponding to 180.8 gallons per ton.

*No. 1072b* consisted of 287½ pounds of grapes fermented in a closed vat; temperature of room, 70° F. Fermentation started on September 18th at 72.5°, and reached its maximum of 95° on the 20th. On September 23d temperature had fallen to 75°; the pomace and wine were left together in the vat closely sealed till October 19th, when they were pressed. The yield from the above amount was 28½ gallons, corresponding to 162.7 gallons per ton.

*No. 1072c* consisted of 167 pounds of grapes fermented in an outside temperature of 63° F. Fermentation commenced very gently on September 18th at 72°, and reached its maximum of 93° on the 20th, gradually falling to 80.5° on the 21st, when the wine was pressed. The yield from the above amount was 14½ gallons, corresponding to 175.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—*No. 1072.*—1889. October 30. Condition clear, with not pronounced bouquet; clean taste, agreeable but not marked flavor; high acid; well-proportioned body, astringency, and alcohol; quality good.

November 11. Racked and taken to cellar.

1890. January 14. Bouquet very much developed; taste clean and agreeable. Lees contain only large amount of alcoholic ferment.

May 4. A bright and sound wine. Racked.

May 15. Lees still sound.

June 9. Condition bright; general quality good.

July 10. Lees sound.

July 31. The sediment shows a few bitter germs.

August 14. A bright wine, less matured than *a* and *b*, but good, and perhaps better flavored.

August 18. Racked again.

September 29. A bright wine, and in good order, but acid seems to have increased. The sediment contains a few acetic germs.

1891. January 1. Lees contain still a very little acetic ferment. It is a bright wine, with a good bouquet and flavor, clean taste, and an acid higher than *a*; not so advanced, but well developed.

March 25. The wine bottled August 18, 1890, is spoiled. The main sample was racked.

**No. 1072a.**—1889. *October 30.* Condition clear, with some, but not very agreeable, bouquet; somewhat flat taste, and the least acid of the four samples, except *b*; high astringency, and medium alcohol and body; general quality fair; requires blending.

1890. *January 14.* Flavor developing, and not so raw as No. 1072, but bouquet not very agreeable, almost suspicious. The sediment is sound.

*April 27.* Racked the wine.

*May 15.* Lees sound.

*June 9.* Condition bright; bouquet and flavor improved; the most advanced of the series, but the roughest in taste.

*July 31.* Lees show much "*pastorianus*" ferment.

*August 14.* A bright and much improved wine since last tasting. Racked again.

*December 31.* Lees sound.

1891. *January 2.* Condition bright, with good bouquet and flavor, clean taste, medium acid and astringency; well-matured wine of good general quality.

*March 16.* Racked again. The wine bottled August 19, 1890, is spoiled.

**No. 1072b.**—1889. *October 30.* Condition nearly clear, with a slight bouquet, clean taste, agreeable flavor, acid much the lowest of the four, high astringency, medium alcohol and body, and good quality.

*November 11.* Racked and taken to cellar.

1890. *January 16.* Rather rough taste, agreeable bouquet, and wine not as much developed as No. 1072. Lees sound.

*May 13.* Wine bright and sound; racked.

*May 15.* Lees still sound.

*June 9.* A bright wine, with a good bouquet and flavor, and smoother than No. 1072.

*July 31.* Lees contain much "*pastorianus*" ferment.

*August 14.* A bright wine, with a delicate and pleasing bouquet and flavor, and quite sound taste.

*August 18.* Racked the wine.

1891. *January 1.* Lees show "*pastorianus*" ferment and a little of acetic ferment.

*January 2.* Condition bright, with a somewhat acetic odor, high acid, good flavor, well aged, and of good quality, but rather thin.

*March 19.* Wine bottled August 18, 1890, is spoiled; the wine from keg racked again at date.

**No. 1072c.**—1889. *October 30.* Condition clear, with a clean taste; flavor disguised by acid, which is high; good astringency; medium alcohol and body; of a general quality, but the acid is too high.

*November 7.* Racked and taken to cellar.

1890. *January 16.* Bouquet good, and the somewhat prominent acid toned down; the flavor is fruity. Lees sound.

*May 2.* A bright wine, with slight suspicion of tainted acid. The wine in bottle spoiled by lactic ferment; racked.

*May 15.* Lees show a little lactic ferment.

*March 29.* Wine not quite bright, and has a perceptible lactic taste; pasteurized.

*June 9.* A bright wine, somewhat flat; light color, and very slight lactic taste.

*July 3.* Lees show a few dead lactic germs.

*August 14.* Bright wine, but tastes a little of bad acids; racked again.

1891. *January 1.* Lees show both lactic and acetic ferments. A bright wine, with rapid bouquet and flavor, high acid, and a general insipid and exhausted quality.

*March 16.* Racked. The wine bottled August 19, 1890, is spoiled.

**No. 1132. Barbera.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 3d, and were crushed the same day. They were in good condition, but much covered with sulphur. They were in close, medium-size bunches of large oval grapes. Maturity was complete. Juice showed 24.25 per cent of solid contents. Fermentation of 109 pounds crushed started October 4th, and attained its maximum of 89° on October 5th. October 7th half of the amount was pressed, and the other (1132a) left on the pomace for color experiment. The yield from the above amount was 8½ gallons of wine, corresponding to 158½ gallons per ton.

**RECORD OF TREATMENT AND TASTING.**—**No. 1132.**—1889. *October 30.* A marked bouquet; an agreeable and developed flavor; clean taste; full but not too much acid; high tannin; medium alcohol and body; quality good.

*November 12.* Racked and taken to cellar.

1890. *January 17.* Wine clear and taste sound; bouquet advancing. Lees sound.

*April 2.* Racked.

*May 15.* Lees still sound.

*June 13.* Condition clear, with a little bouquet; good flavor; pleasant acid; tastes of cask, otherwise of good quality and sound.

*August 4.* Lees show some acetic ferment.

December 31. Lees show much "*pastorianus*" ferment,  
1891. January 7. Condition bright, with slight bouquet and little flavor. The wine has deteriorated since last tasting.

March 13. Bottled the wine.

No. 1132a.—1889. November 12. Pressed and taken to cellar.

1890. January 17. Condition clear, with good but not very dark color; not marked bouquet, and flavor not as good as in previous wine; the taste is a little flat; full acid and astringency; medium body and alcohol, and the quality lower than the other wine, but still good. Lees show only alcoholic ferment.

April 2. Racked.

May 15. Lees still sound.

June 13. Condition clear, with a slightly acetic odor, and a flavor somewhat covered by acetic taste; the quality is much inferior to No. 1132.

August 4. Lees contain lactic ferment.

December 31. The sediment is still full of lactic germs.

1891. January 7. The wine being quite spoiled was discarded.

### Discussion of Results.

Summarily the above record shows the following points:

The Barbera, in regard to its productiveness, has shown itself to be a good bearer at the Cupertino Experimental Plot. In 1889 the crop gathered was at the rate of about  $3\frac{1}{2}$  tons per acre; in 1890 it was at the rate of  $6\frac{1}{4}$  tons. The latter may be taken as an abnormal crop, so long as no other example has been had of the same kind, for the Barbera has never been found to be so heavy a bearer as the Fresa.

At Mission San José it has borne, after the second year from the graft, at the rate of about 3 tons per acre, the bearing being exceedingly uneven; some vines loaded, others almost barren, and remaining consistently so in successive seasons, thus apparently indicating that, as in the Ploussard, the wood should be selected from fertile stocks. In exposed locations it has shown occasional aggravated coulure from sunburn of bloom.

The saccharine strength of its grapes reaches about 25 per cent of sugar as an average, which comes very near to the sugar percentage of other Piedmontese varieties already tried. The same cannot be said in regard to its acidity, which has varied from .71 to 1.34 per cent, and therefore shows it to be the most acid grape that attains such high saccharine strength, thus being of special importance for warm locations.

The alcoholic strength of its wine ranges from 11 to 12.54 per cent (volume), except in case of the 1888 vintage from Mission San José, when the wine reached 13 per cent of alcohol by volume.

As to tannin, it has varied from .15 per cent in young grafts to .351 per cent in older vines; but while making quite an astringent wine, the Barbera does not surpass the Fresa in this respect.

As to color, it has shown itself to be quite near the Fresa, but remains, like the latter, inferior to the Bonarda; however, it has a satisfactory color.

Acidity is also one of the peculiar qualities of the Barbera, producing the most acid wine of the whole Piedmontese varieties; but in California, this acidity is not as high as in Piedmont, while on the contrary it seems, as to body, to be higher than what it is reported from Italian analyses. This, of course, is due not only to the different nature of the California soils, which generally have, so far, produced heavy-bodied wines, but also to the long training given in the culture of the Barbera in Piedmont (resulting in a lower amount of sugar and higher amount of acidity), and to the longer fermentation there than here.

In view of the probable future of the vinification of the Barbera



grapes in some localities of the State, we made in 1889 some experiments of different fermentations with this variety.

The first experiment was made upon grapes donated by Professor Hilgard, and consisted of the following samples:

No. 1072.—Usual fermentation (floating cover) at 72° F. (outside temperature).

No. 1072a.—Fermentation at 95° F.

No. 1072b.—Fermentation in a closed vat.

No. 1072c.—Fermentation at 63° F.

Upon another lot of grapes obtained from the Cupertino Plot, and marked 1132 and 1132a, a color experiment was conducted.

In glancing at the analytical results of the wines of the 1072 series, we see at first that the largest amount of alcohol is found in the case of the fermentation in a closed vat, the proportion being 12.18 per cent by volume; and the lowest amount (11.45) in the fermentation at 95° F. This of course is due to loss by evaporation, and to the incomplete transformation of the sugar. Then we note the percentages of 11.91 and 12, respectively, for the "usual fermentation" and for the "fermentation at 63° F." Evidently these data confirm the opinion that the temperature has a large influence on the formation of the alcohol in the wine; the proportion of this ingredient being higher in a closed vat and at a low temperature, and always lower in the case of fermentation at a high temperature, or when the mass of the liquid has the largest surface contact with the air.

The reverse occurs in regard to the acidity. This has been found to be higher at pressing (1.10 per cent) in the case of open vat, and lower (.57 per cent) in the fermentation in closed vat; and this percentage was the lowest of all the series, while it was .99 and 1.02, respectively, for the fermentation at 95° and at 63°. After eight months this acidity had fallen almost equally in all the four samples, and varied from .50 to .55 per cent, but remaining still in the same ratio as at pressing.

The proportion of tannin was higher (.231 per cent) in the close fermentation on account of the longer maceration of the pomace in the liquid; lower (.214 per cent) in both the fermentations at 95° and 63°, while it was .220 per cent in the usual fermentation at the average temperature of 72° F. However, it was in every case a good tannic wine.

As to body, no difference was observed in the samples Nos. 1072, 1072a, 1072b, for which the proportion was 3.55 per cent; while in No. 1072c, with the fermentation at 63° F., the percentage of body was 3.38. This can be easily understood, as it is known that the dissolving power of the alcohol for the extractive matters increases as the temperature of the liquid in fermentation increases.

As to color, if we compare the four different samples one month after the first fermentation, we see that the highest amount is reached by the wine fermented in closed vat, on account of the maceration of the pomace; but such proportion quickly decreased, as occurred in the case of the fermentation at 95° F., and seems to be due especially to the lower percentage of acidity, which greatly influences the stability of the coloring matter. In the case of the fermentation at a lower temperature and in presence of a larger amount of acidity at the time of pressing, the coloring matter has been more stable. At seven months from pressing the most deeply colored wine was that from the usual fermentation, and the least colored was that fermented at 95°.

Nos. 1132 and 1132*a* represent samples for color experiment. The first fermentation having ceased in No. 1132, only half of it was pressed, and the other (1132*a*) left on the pomace in order to see how large would be the oxidation of the coloring matter. The difference in color, however, has been quite small; on the day after pressing, the difference was only 2 per cent in favor of No. 1132, while after seven months it was only 1.2 per cent in favor of the same number. Sample 1132*a* resulted in less acid and more alcohol than sample 1132, but as to quality it was very inferior to the latter. In general, the long maceration on the pomace has been the cause of the difference against the conservation of color.

Finally, concerning the different modes of fermenting this variety, the Barbera has proved to be well adapted to either of them, giving satisfactory results as to the composition of the wine. It can therefore be used for vinification in warm countries as well as in cool locations. In quality the wine itself has proved generally good and has kept well, but it has shown, as is generally the case in all Piedmontese wines, that it should be bottled later than other wines, because it requires a longer time for its complete defecation. It will then have lost a part of its high acidity and astringency and acquired an agreeable bouquet, a pleasant flavor and taste, which reminds us of the Bordeaux wines.

#### BONARDA.

According to Count di Rovasenda, the Italian ampelographer, two different varieties are cultivated in Piedmont under the name of Bonarda. One of them, which is especially used as a table grape, is sometimes also named Balsamea, and is cultivated in the Ivrea, Biellese, and Alto Novarese districts; while the other one, viz.: the true Bonarda, is found in the hill lands of the Turin, Monferrato, and Asti districts. The latter variety is principally used for wine-making, and sometimes also for the table.

The vine is vigorous and productive, and only very little attacked by mildew. The grape gives an abundance of must, which is somewhat thick, but is deep colored. It is very useful in vinification; alone, it makes a heavy dry wine of good character, which improves greatly in the bottle. It is used frequently to correct musts of low quality in order to obtain good table wines for the trade.

On heavy soils exposed to the sun, the Bonarda gives a good crop of fine quality, but it does not bear prolonged cold weather. Count di Rovasenda reports that he obtained some fruit even in the second year from a plantation of Bonarda made by himself from cuttings.

*Description.*—Leaves of medium or above medium size, almost entire, nearly glabrous on the upper side, while below they are covered with a lanuginous down, which in the fall turns reddish at the edges of the leaves. Bunches above medium size, long, conico-cylindrical, branched, loose rather than compact. Berries above medium size, spherical; flesh firm, juicy, quite sweet, slightly astringent; skin tough, and of a good black and pruinose aspect. Maturity second period.

TABLE OF PRODUCTION.

| BONARDA.                                                                       | Number of Vines. | Total Weight of<br>Grapes, in lbs. | Average per Vine,<br>in lbs. | Date of Picking |
|--------------------------------------------------------------------------------|------------------|------------------------------------|------------------------------|-----------------|
| 1888—No. 905 (1). J. T. Doyle, Experimental Plot, Cupertino                    | 4                | 14                                 | 3.5                          | Oct. 9          |
| No. 905 (2). J. T. Doyle, Experimental Plot, Cupertino                         | 6                | 23                                 | 3.8                          | Oct. 9          |
| No. 906 ("True"). J. T. Doyle, Experimental Plot, Cupertino                    | 14               | 80                                 | 5.6                          | Oct. 9          |
| 1889—No. 1149 (Corba Barba Gelata?). J. T. Doyle, Experimental Plot, Cupertino | 20               | 200                                | 10.0                         | Oct. 8          |
| No. 1157 (Provinante?). J. T. Doyle, Experimental Plot, Cupertino              | 4                | 20                                 | 5.0                          | Oct. 9          |
| 1890—Row 102. J. T. Doyle, Experimental Plot, Cupertino                        | 20               | 142                                | 7.0                          | Oct. 15         |



## COLOR READINGS.

| BONARDA.           | 1888.                     |              | 1889.       |                 |
|--------------------|---------------------------|--------------|-------------|-----------------|
|                    | John T. Doyle, Cupertino. |              |             |                 |
|                    | No. 905.                  | No. 906.     | No. 1149.   |                 |
| Must               | October 15.               | October 16.  | October 14. |                 |
| At pressing { Date | 90.9 1-2 V. R.            | 80.0 2 V. R. | 137.9       | 1+ V. R.        |
| One month { Color  | 61.5 2 V. R.              | 71.4 2 V. R. | 114.2       | V. R. + 1 V. R. |
| Two months         | 50.6 2 V. R.              | 68.9 3 V. R. | 61.0        | 1 V. R.         |
| Three months       | 25.0 3 V. R.              | 61.5 2 V. R. | 52.6        | 1 V. R.         |
| Four months        | 26.6 4 V. R.              | 63.0 2 V. R. | 50.0        | 1 V. R.         |
| Five months        |                           |              | 47.0        | 1 V. R.         |
| Eight months       | 20.0 1 R.                 | 53.3 2 V. R. |             |                 |

*Nos. 905, 906. Bonarda.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 10, 1888, and were crushed the following day. Their condition was good. Three different lots arrived, labeled Bonarda No. 1 (905'), Bonarda No. 2 (905'), and "True" Bonarda, or 906. Nos. 1 and 2 resembled each other very closely in all particulars, but No. 2 has less sugar, which might be due to pruning. The true Bonarda was much thicker skinned than Nos. 1 and 2, although externally it closely resembles them. The true Bonarda when pulled from the stem pulls clean, but Nos. 1 and 2 leave an unusual amount of pulp behind, almost as much as the Mondeuse. The berries of all are round and small, with good color. The stems of the "true" are drier than those of Nos. 1 and 2. Bunches cylindrical and medium length. Juice of No. 1 showed 24.16 per cent of solid contents; No. 2, 24.64 per cent, and the true Bonarda the same. Fermentation of a mixture of 22½ pounds of No. 1 and 65½ pounds of No. 2, started October 12th; attained its maximum of 85° October 14th, and was pressed the next day. Six and five eighths gallons were obtained from the mixture, corresponding to 157.74 gallons per ton. The true Bonarda, crushed October 11th, was placed in hot-box. The maximum temperature obtained was 93° on October 13th. It was pressed on the afternoon of October 15th. The quantity of wine obtained was ¾ gallon from 12.25 pounds crushed, corresponding to 142.6 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 28.* Taken to cellar.

*December 15.* Wine clear, with undeveloped bouquet, high alcohol and astringency, and medium acid. Lees sound.

1889. *January 12.* An excellent light wine, just the thing wanted hereabouts both as to flavor and lightness.

*March 29.* Pasteurized.

*May 16.* Racked; condition clear.

*August 7.* Condition bright, with a good red color; little, but agreeable bouquet; pleasant flavor; developed taste; good body; medium acid and alcohol; full astringency; of good quality; stands dilution fairly well.

*November 11.* Agrees with last tasting; bouquet has improved and wine matured.

1890. *February 10.* Lees contain considerable amount of "pastorianus" ferment.

*February 15.* Condition bright, with a good color; rather improved bouquet, but rather exhausted taste, though still sound.

*March 10.* Racked.

*No. 906, or True Bonarda.*—1888. *November 22.* Racked and placed in cellar; wine clean, vinous, and sound.

1889. *April 3.* Racked again; condition clear; clean, with full acid.

*August 7.* Bright, with very good violet-red tint; undeveloped bouquet; slightly flat flavor; slightly bitter taste; good body; full acid and astringency; fair quality; stands dilution well.

*November 5.* Two bottles (that remained) quite spoiled.

*No. 1149. Bonarda No. 1, or "Corba Barba Gelata?"* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 9, 1889, and were crushed the same day. They were in good condition. The bunches were medium size, conical, shouldered, and compact. Grapes medium round, or slightly oval; skin rather thick and tough, and dark colored; flesh soft and juicy; juice slightly red; stems green and slender; pedicels short. They had passed their maturity, some dried grapes being on most of the bunches. Picked the day after a heavy rain. The juice showed 25 per cent of solid contents. Fermentation of 98½ pounds crushed started October 10th; reached its maximum of 88° on the morning of October 12th; on the 14th the wine being quite dry, was pressed. The yield from the above amount was 8½ gallons, corresponding to 172.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 5.* Not quite clear, with an undeveloped bouquet, agreeable flavor, clean and fruity taste, fair acid, and high astringency. The wine promises well.

*December 7.* Racked and taken to cellar.

*1890. January 17.* Condition clear, with an intense color, advancing bouquet, full body. A full complete wine, rather rough as yet, but improving rapidly. Lees sound.

*April 27.* Racked.

*May 19.* Lees show slight amount of lactic germs.

*May 22.* Lactic acid not perceptible to taste. Pasteurized.

*June 5.* A bright wine with a light but pleasing bouquet and full flavor; a clean, smooth, and well-developed taste and good quality.

*July 31.* Lees sound.

*1891. January 2.* A bright wine, of good color, flavor, and bouquet, marked and pleasing acid, medium astringency; general quality, smooth and sprightly.

*March 17.* The wine bottled May 22, 1890, is bright and has little deposit; full rich flavor. Racked the wine and bottled a part.

*No. 1157. Bonarda No. 2, or "Provinante?"* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 10th, but in too small a quantity to make wine. The bunches and grapes seemed to correspond to Pulliat's description of Bonarda, but the leaves were altogether different.

Leaves rather small, wider than long, smooth above and slightly hairy below. Upper sinuses deep and almost closed, lower sinuses well marked, but not deep; basal sinus open. Teeth short but pointed. The grapes were mature and in good condition. Juice showed 25.9 per cent of solid contents; not enough for wine.

### *Discussion of Results.*

Three varieties labeled "Bonarda" were grafted at the Cupertino Experiment Plot; two of them were named by the Italian foreman respectively, Corba Barba Gelata and Provinante. A close study showed the presence of the true Bonarda, and of the Bonarda di Gattinara and Pruné, varieties quite different from the former.

In its productiveness the Bonarda has not thus far shown itself to be as good a bearer as it is reported in Italy; in fact, only one and three fourths tons per acre were obtained in 1888 at Cupertino. A larger amount was gathered from the Bonarda di Gattinara and Pruné, but these varieties have not been tried enough to enable us to give a definite judgment upon them.

The saccharine strength of the true Bonarda has varied from 24.64 per cent to 25.19 per cent, while in the case of Bonarda di Gattinara and Pruné it has been, respectively, 26 and 25.9 per cent. The acidity

also was higher in the latter grapes (.60 to .67 per cent) than in the true Bonarda (.44 to .61 per cent).

The alcoholic strength of the Bonarda wine varies from 10.58 to 11.00 (volume) per cent, while the Bonarda di Gattinara gave 13.09 per cent.

As to astringency, the Bonarda approaches very near the Fresa, the tannin being from .34 to .401 per cent, a very high figure; but in acidity it is higher than the latter. The Bonarda is also a heavy-bodied wine, having from 2.95 to 3.10 per cent of extract, and represents the most deeply colored of all the Piedmontese wines; the percentage of color was at eight months 53.3 per cent, with a "second violet-red" tint.

The Bonarda wine has not been as good a keeper as the Nebbiolo, the Fresa, and the Barbera, but it seems capable of producing a fine wine in blends with some other varieties.

We may consider this grape as one of good promise, but requiring further study to determine its best adaptations.

#### FRESA (FREISA, FRESIA).

The Fresa is widely cultivated in the vineyards of Piedmont, and especially in the neighborhood of Turin, Monferrato, and Gattinara, where it is known also under the name of Spanna Monferrina, on account of the likeness of its bunches to those of the Spanna, or Nebbiolo. The vine is vigorous and very productive, and stands rigorous winters well. It grows and bears in all kinds of soils, and in different exposures; but the soils which seem to suit it best are calcareous ones on good hill exposures. The different locations given to its culture have influenced very much the reputation of its wine, many growers having in view more the quantity than the quality of the product.

Its rather rough and late-maturing wine is not of as high quality as that of the Nebbiolo and other Piedmontese varieties; but in order to obtain a more agreeable and easily salable wine, blending by fermentation with other grapes, especially with the Bonarda, is practiced.

This vine in good soils attains an age of seventy and even a hundred years. According to Rovasenda, any kind of pruning suits this variety, but in the "filagne" culture in Piedmont it is pruned long, and only after a certain age is it pruned shorter, in order to prolong its life. It is much esteemed for its resistance to mildew, and has replaced the Nebbiolo and other varieties in many plantations. It is reported also that this variety is being widely propagated, and will have a great future in the Piedmontese vineyards.

*Description.*—Leaves wider than long, glabrous on both sides; upper sinus rather deep and narrow, petiolar sinus always very open; margin sharply, but not deeply, dentate. Bunches rather long, conico-cylindrical, rather compact, on a long and rather slender peduncle. Berries average or over-average size, almost spherical, on rather long and slender pedicels; flesh soft and juicy, somewhat astringent; skin rather tough and thick, changing from red to bluish-black, pruinose. Maturity at the end of the second period.

TABLE OF PRODUCTION.

| FRESA.                                                                 | Number of Vines. | Total Weight of<br>Grapes, in lbs. | Average per Vine,<br>in lbs. | Date of Picking. |
|------------------------------------------------------------------------|------------------|------------------------------------|------------------------------|------------------|
|                                                                        |                  |                                    |                              |                  |
| 1887—No. 740. J. T. Doyle, Experimental Plot, Cupertino                | 20               | 200                                | 10.00                        | Oct. 14          |
| 1888—No. 919 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino | 16               | 50                                 | 3.11                         | Oct. 18          |
| No. 924 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino       | 20               | 295                                | 14.75                        | Oct. 18          |
| 1889—No. 1145. J. T. Doyle, Experimental Plot, Cupertino               | 19               | 150                                | 7.89                         | Oct. 2           |
| 1890—Row 2. J. T. Doyle, Experimental Plot, Cupertino                  | 20               | 205                                | 10.25                        | Oct. 12          |



| FRESA.                                              | Date of Picking | MUST. |                  |                      |                           | WINE.     |        |                        |               |
|-----------------------------------------------------|-----------------|-------|------------------|----------------------|---------------------------|-----------|--------|------------------------|---------------|
|                                                     |                 | Ash   | Acid as Tartaric | Sugar by Copper Test | Solid Contents by Spindle | Alcohol   | Tannin | Total Acid as Tartaric | Volatile Acid |
|                                                     |                 |       |                  |                      |                           | By Volume |        | At Six to Eight Months |               |
|                                                     |                 |       |                  |                      |                           | By Weight |        | At Pressing            |               |
| 1886—No. 529. J. T. Doyle, Cupertino.               | Oct. 4          | 30    | 1.31             | 17.17                | 17.50                     | *8.49     | 160    | 1.12                   |               |
| No. 596. J. T. Doyle, Cupertino †                   |                 |       |                  |                      |                           | 7.50      |        |                        |               |
| 1887—No. 740. J. T. Doyle, Cupertino                | Oct. 14         |       |                  |                      | 24.32                     | 7.78      | 240    | .72                    | 2.72          |
| 1888—No. 919 (short-pruned). J. T. Doyle, Cupertino | Oct. 18         | .33   | .90              | 23.61                | 24.54                     | 9.53      | .320   | .71                    | 2.60          |
| No. 924 (long-pruned). J. T. Doyle, Cupertino       | Oct. 18         | .28   | .51              | 25.76                | 26.69                     | 8.98      | .332   | .56                    | 3.10          |
| 1889—No. 1043. Margherita Vineyard, Fresno          | Oct. 18         | .38   | .63              | 26.86                | 28.63                     | 9.76      | .420   | .46                    | 2.70          |
| No. 1145. J. T. Doyle, Cupertino                    | Sept. 2         | .54   | .48              | 23.67                | 23.75                     | 9.20      |        | .40                    | 3.60          |
| No. 1145. J. T. Doyle, Cupertino                    | Oct. 2          | .36   | .77              | 24.12                | 23.80                     | 9.78      |        | No wine                |               |
| 1890—No. 1327. J. T. Doyle, Cupertino               | Oct. 12         | .21   | .94              |                      | 23.90                     | 12.18     | .331   | .63                    | 3.02          |
|                                                     |                 |       |                  |                      |                           | 9.78      | .461   | .53                    | 3.08          |

\* December, 1886. † June, 1887. ‡ Wine sent for examination.

## COLOR READINGS.

| FRESA.                  | 1886.                     |                | 1887.                  | 1888.                      |                           | 1889.        |
|-------------------------|---------------------------|----------------|------------------------|----------------------------|---------------------------|--------------|
|                         | John T. Doyle, Cupertino. |                |                        |                            |                           |              |
|                         | No. 523.                  | No. 596.*      | No. 740.               | No. 919<br>(short-pruned). | No. 924<br>(long-pruned). |              |
| Must.....               | October 14.               | October.       | October 24.            | October 24.                | October 27.               | October 8.   |
| At pressing { Date..... | 48.6 2 V. R.              | 71.4 4 V. R.   | 44.4 5 V. R.           | 68.9 5 V. R.               | 13.1 4 V. R. 1 Y.         | 74.1 4 V. R. |
| One month.....          | 32.8 1 V. R.              | 45.9 3-4 V. R. | 30.8 1 R. 34.8 1 R.    | 50.0 5 V. R.               | 12.2 1 R. 1 Y.            | 32.0 5 V. R. |
| Two months.....         | 29.0 1 V. R.              | 35.7 4 V. R.   | 22.2 1 R. 23.5 R.-1 R. | 34.8 1 R.                  | Wine spoiled.             | 25.1 R.      |
| Three months.....       |                           |                | 21.6 R.                | 23.7 2 R.                  |                           | 25.1 R.      |
| Four months.....        |                           |                |                        |                            |                           |              |
| Six months.....         | 17.1 3 V. R.              |                |                        |                            |                           |              |
| Seven months.....       | 16.6 4 V. R.              |                |                        |                            |                           |              |
| Eight months.....       |                           |                |                        |                            |                           |              |

\* Wine sent for examination.

**No. 740. Fresa.** From J. T. Doyle, Cupertino, Experimental Plot. The grapes arrived October 15, 1887, and were crushed October 17th. Their condition was very good; fully ripe, and enough acid; average coulure, quite 50 per cent, and berries on the whole larger than last season. The juice showed 24.32 per cent of solid contents. Fermentation of 97 pounds crushed began on October 18th, and reached its maximum of 84° on the 20th. The murk was drawn off on the 24th, seven days from crushing. The yield from the above amount was  $7\frac{1}{8}$  gallons, or at the rate of 153 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 9.** Racked and pasteurized the young wine for safety.

**December 16.** The wine has too much carbonic acid gas to allow of a proper judgment; it is strongly astringent, apparently sound, and contains a little sugar.

**1888. February 8.** A satisfactory wine, with a peculiar flavor, something like Zinfandel; its condition is bright, and body light.

**May 28.** Again racked the wine.

**June 8.** Condition bright, with a well-developed bouquet and vinosity, moderate acid, but slightly acetous; high astringency, and rough and bitterish after-taste. The microscope shows, in the sediment, a small amount of acetic ferment.

**1889. November.** (Sample in bottle.) Condition bright, with a good, dark, purplish-red, color; marked bouquet; agreeable and vinous flavor, and clean taste; full body, alcohol, and astringency; medium acid, good quality, and will stand dilution with nearly 100 per cent of water.

**No. 924 (long-pruned). Fresa.** From J. T. Doyle, Cupertino. The grapes arrived October 23, 1888, and were crushed the same day. Their condition was good, considering that they had been picked since October 18th. They presented a somewhat wilted appearance; stems commencing to dry out; berries sweet but with adequate acid; coulure percentage low. Juice showed 26.69 per cent of solid contents. Fermentation of 38.5 pounds crushed started on October 24th, and reached its maximum of 102.5° the next day;\* on the 27th it had fallen to 91.5°, and was pressed the same morning. The amount of wine obtained was  $2\frac{1}{8}$  gallons, corresponding to 100.65 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. November 28.** Taken to cellar.

**December 14.** Lees show lactic germs; pasteurized.

**1889. January 12.** "Good; very like the Zinfandel, and would have been preferable, being of higher quality." (E. W. H. and F. P.)

**February 28.** Racked; lees show effete yeast and dead lactic germs.

**August 7.** Condition bright, with a color twice as deep as Fresa, No. 919. Very marked and agreeable bouquet; pleasant flavor, clean taste, good body and quality, full astringency, acid, and alcohol; stands dilution very well.

**1890. February 10.** Lees show some bitter ferment.

**February 13.** Condition bright, with quite a clear taste; wine still rough, but pleasant.

**No. 919 (short-pruned). Fresa.** From J. T. Doyle, Cupertino. The grapes arrived October 19, 1888, and were crushed the same day. Their condition was only fair; each bunch had either dried or half-dried berries; coulure mostly early, varies from 10 per cent in some bunches to 85 per cent in others; fully ripe, with full acid; berry oval, medium size with considerable bloom (pruinose). Juice showed 24.64 per cent of solid contents. Fermentation of 155 pounds crushed started October 20th, and reached its maximum of 93° on the 21st. It was pressed on the 24th. The yield was  $12\frac{1}{4}$  gallons, corresponding to 164.5 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. December 3.** Taken to cellar.

**December 17.** Racked; condition clear, with a pleasant, sound taste; a bouquet developing, and something similar to the Zinfandel; heavy body; medium alcohol; of high quality; lees sound.

\* Fermented in a hot chamber on account of slow starting of fermentation.

1889. *March 18.* Lees show lactic germs; pasteurized.

*May 16.* Racked again; condition clear.

*August 7.* Condition bright, with a good red color, a very marked and agreeable bouquet, nutty flavor, developed taste, good body, medium acid, and full astringency and alcohol; quality is very good, and stands dilution very well.

*November 12.* Tasting agrees with that of August 7th; quality very good.

1890. *February 10.* Lees show some bitter ferment.

*February 22.* Condition bright; wine mature; retains its high quality.

*No. 1043. Fresa.* From Margherita Vineyard, Fresno. The grapes arrived September 5, 1889, and were crushed the following day. They corresponded to Pulliat's description, with the exception that the berries were smaller and the color darker. Quite overripe; commencing to dry up. Condition not good on account of loose packing, and there being but a very small quantity, it was fermented for color testing only. Three fourths of a gallon were obtained. Juice showed 29.75 per cent of solid contents. Fermentation started on September 7th; the maximum temperature of 75° was reached in the afternoon of the same day, and it was pressed September 12th, being still very sweet. On September 14th the solid contents were 12 per cent, and on the next day 9.9 per cent, when the wine was quite spoiled and therefore rejected.

*No. 1145. Fresa.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 4, 1889, and were crushed the same day. Bunches very irregular, generally small, loose, and shapeless, but sometimes long, cylindrical, and close; sometimes shouldered; grapes round, medium size; skin thick and rather tough; flesh soft and shriveled from overripeness; condition otherwise fair. Juice showed 23.9 per cent of solid contents. Fermentation of 137 pounds crushed started October 5th and reached its maximum of 92.5° on the 6th. On the 8th it was pressed. Eleven and nine sixteenths gallons of wine were obtained, corresponding to 168.8 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 30.* Condition nearly clear, with advanced bouquet, a pleasant and vinous flavor, clean taste, high acidity and astringency; its general quality promises well.

*December 7.* Racked and taken to the cellar.

1890. *January 17.* Condition clear, with fair color, marked and rather coarse bouquet, characteristic flavor, clean but rough taste, medium acid, high astringency, good body; whole wine is rough, but with all the qualities for keeping well. Lees sound.

*May 11.* A clear, sound, and promising wine, but still rough and somewhat coarse. Racked.

*May 19.* Lees show a little lactic ferment. Pasteurized the wine.

*June 3.* A bright wine, with its bouquet and flavor toned down, and the wine in general smoother, but high astringency remains still. It seems to have improved since last tasting.

*July 31.* Lees sound.

*August 29.* A bright, well-developing wine.

1891. *January 1.* Lees sound. The wine is bright, and has bouquet and flavor fairly agreeable, but coarse taste, rather flat; medium acid and astringency; general quality fair.

*March 24.* Racked and bottled the wine.

### *Discussion of Results.*

The Fresa, at the Cupertino Experimental Plot, has proved to be a heavy bearer if pruned long, while short-pruning gave always a poor crop. In 1888 the crop from long-pruned vines was at the rate of about 4½ tons per acre, while from short-pruned vines the rate was little more than 1 ton per acre. In 1890, on account of coulure, the rate was only about 4 tons per acre from long-pruned vines. It may in general be rated like the Zinfandel in this respect.

The grapes at the time of maturity frequently contain more than 26

per cent of sugar, and the proportion of acid is from .63 to .77 per cent; while in a warm climate, like that of Fresno, a higher percentage of sugar (29.67) and a lower proportion of acidity (.48) were observed.

The wine, so far as experimented with, seems to give more than 12 per cent of alcohol by volume, and to be more astringent than all other Piedmontese varieties; in fact, tannin in the Fresa varies from .33 to .42 per cent, while its acidity is lower than in the Barbera wines. In body it stands generally with the Barbera, being a heavy-bodied wine. It seems to be the most highly colored wine among those obtained from the Piedmontese varieties, except the Bonarda. It runs very nearly with the Zinfandel.

The Fresa wine is a very good keeper, but it ages slowly, therefore it is important to ferment the grapes with other varieties, as stated in the introductory paragraph.

#### REFOSCO AND CRABB'S BLACK BURGUNDY.

##### *Refosco.*

The Refosco is especially cultivated in the Venitian region, Italy, where it produces a blending wine, rich in tannin, acid, and coloring matter. The vine is strong, vigorous, and a good bearer when placed in calcareous and deep soils; it does well with long pruning, but it seems to do the same with half-long or short pruning, according to the vigor of the vine and the nature of the soil.

*Description.*—Leaves large, five-lobed; lobes lengthened and acuminate, covered on the lower side with a short and compact lanuginous pubescence, which is somewhat less thick on the veins and petiole; sinuses deep, or rather deep, making a closed or nearly closed opening by the approach of the upper part of the lobes; petiole of average length, rather slender, reddish, like the veins, at their point of junction. Bunches average size, lengthened and cylindrical or slightly conico-cylindrical, a little shouldered, rather compact, and slightly curved; peduncle rather long, somewhat strong, woody to the node; main stem strong, of yellowish-green color. Berries spherical, or almost spherical, small or under average size; pedicels strong and swollen at the base of the berry, reddish-brown; skin thick, tough, at first of light green color, changing to rose, afterward to bluish-black, very pruinose; flesh somewhat firm, juicy, with a slight acid taste. Maturity (in Italy), third period.



## COLOR READINGS.

| REFOSCO.                 | 1889.                                |                                                                                       |
|--------------------------|--------------------------------------|---------------------------------------------------------------------------------------|
|                          | J. Gallegos,<br>Mission<br>San José. | J. T. Doyle,<br>Cupertino.                                                            |
|                          | No. 1094.                            | No. 1136.                                                                             |
| Must.....                | } No wine. {                         | October 8.<br>142.8 1st + + V. R.<br>85.1 V. R.—1 R.<br>67.8 V. R.—1 R.<br>60.0 V. R. |
| At pressing { Date ..... |                                      |                                                                                       |
| { Color .....            |                                      |                                                                                       |
| Two months .....         |                                      |                                                                                       |
| Three months .....       |                                      |                                                                                       |
| Seven months .....       |                                      |                                                                                       |

*Crabb's Black Burgundy.*

This variety much resembles the Refosco, the only apparent difference being the elliptical shape of its berries instead of being round or nearly round as in the Refosco; moreover, the former matures in the first period. The Refosco, however, matures here at about the same time. Its cuttings root with some difficulty in the open ground, and are best rooted in the nursery, and transplanted. Both varieties are so well shaded by an abundant foliage that coulure and sunburn are almost unknown on them.

TABLE OF PRODUCTION.

| CRABB'S BLACK BURGUNDY.                                                        | Number of Vines.. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs. .... | Date of Picking... |
|--------------------------------------------------------------------------------|-------------------|---------------------------------------|-----------------------------------|--------------------|
| 1887—No. 732 (long-pruned). J. T. Doyle, Experimental<br>Plot, Cupertino.....  | 20                | 110                                   | 5.50                              | Oct. 13            |
| No. 761 (short-pruned). J. T. Doyle, Experimental<br>Plot, Cupertino.....      | 20                | 15                                    | .75                               | Oct. 19            |
| 1888—No. 907 (short-pruned). J. T. Doyle, Experimental<br>Plot, Cupertino..... | 16                | 15                                    | .93                               | Oct. 10            |
| No. 908 (long-pruned). J. T. Doyle, Experimental<br>Plot, Cupertino.....       | 15                | 170                                   | 11.33                             | Oct. 10            |
| 1889—No. 1123. J. T. Doyle, Experimental Plot, Cupertino.                      | 39                | 500                                   | 12.82                             | Oct. 1             |







*No. 1094. Refosco.* From John Gallegos, Mission San José. The grapes arrived in good condition on September 19, 1889, but not in sufficient quantity for making into wine. They corresponded to Pulliat's description, except that the grapes were rather oval and very firm. They were quite mature. Juice showed 25.9 per cent of solid contents.

*No. 1136. Refosco.* From J. T. Doyle, Cupertino. The grapes arrived October 3, 1889, and were crushed the following day. They were in rather bad condition, the box having been smashed. Bunches large, branching, irregular, and not compact; berries slightly oval, medium to small in size; skin tough and astringent; flesh rather firm, but juicy; juice acid and without special flavor; stems thick, strong, and woody. Juice showed 23.5 per cent of solid contents. Fermentation of 21½ pounds crushed started October 5th, reached its maximum of 82° on the next day, and the wine was pressed on the 8th. The yield from the above amount was 1½ gallons, corresponding to 157 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 30.* (In glass.) Wine turbid and too young to judge of its qualities.

*December 3.* (In glass.) Condition bright; color very dark; an almost imperceptible bouquet; neutral flavor; flat taste; adequate alcohol, acid, and astringency; and of good quality; racked and taken to the cellar.

*1890. January 30.* Condition bright; taste has improved. Racked again. Lees contain lactic germs.

*May 15.* Condition clear; vinous taste; considerable carbonic acid gas; pasteurized.

*June 23.* A clear wine, with full and pleasing flavor, high astringency, and deep color. General quality quite rough but good.

*1891. March 27.* A clear wine, rough and undeveloped still, but sound and drinkable.

*No. 690. Crabb's Black Burgundy.* From E. W. Hilgard, Mission San José. Grapes arrived September 28, 1887, and were worked the following day. Their condition was excellent; bunches compact, very little coulure; very characteristic; sweet to the taste, and yet with acid enough to give zest. The same grapes tested a week before, in the field, gave only a few tenths per cent less sugar than they do at present. The vines are grafts of the spring of 1886, on Californica stock. The juice showed 24.89 per cent of solid contents. Fermentation of 109 pounds crushed began on the evening of September 29th, and reached its maximum of 93° on October 2d, and remained very violent in its action for two days. It was drawn off on October 5th, six days from crushing. The yield from the above amount was 8½ gallons, or at the rate of 149 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 7.* Racked the young wine.

*December 19.* Condition clear, with heavy body; undefined bouquet; low acid; not clean-tasted.

*1888. February 9.* Fairly developed bouquet; light acid, and medium-heavy body. A sound, fairly smooth wine.

*May 28.* Under the microscope the sediment shows effete yeast and traces of lactic ferment. Racked and pasteurized the sample.

*June 23.* Condition bright, with very characteristic bouquet; medium body; good and pronounced astringency; slight lactic taint in the after-taste.

*No. 732 (long-pruned). Crabb's Black Burgundy.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 14, 1887, and were crushed the following day. The condition was excellent; a great deal of early coulure, hence bunches are not compact, but otherwise sound. Average size of bunches and berries about the same as those from Mission San José, No. 690; sweetness not striking—not over 24 per cent, if that much. Compared with the Refosco, Crabb's grape is quite elliptical instead of nearly round; average size of bunches less and

more compact. The juice showed 25.22 per cent of solid contents. Fermentation of 100.50 pounds crushed began on October 16th; during a violent fermentation it reached its maximum of 84°; continued very active until October 21st. The murk was drawn off October 24th, nine days from crushing. The yield from the above amount was  $7\frac{1}{8}$  gallons, or at the rate of 158 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. December 16. A sound, mild wine, with good bouquet.

1888. February 3. Racked the wine from the lees.

February 8. Condition bright, with heavy body; sound acid and pronounced astringency.

May 24. A microscopical examination of the sediment shows a small amount of lactic ferment; racked and pasteurized the wine.

June 16. Condition bright, with well-developed bouquet, very marked astringency, medium acid, and high body and alcohol.

No. 761 (short-pruned). *Crabb's Black Burgundy*. From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 20, 1887, and were crushed the following day. Their condition was fair, but overripe, being six days after the long-pruned was sent; very sweet, with low acid; vapid tasted; bunches rather small and scraggly from coulure, which will amount to some 50 per cent. The juice showed 27.20 per cent of solid contents. Only twelve pounds were received, and they were blended with Kleinberger (No. 770).

No. 856. *Crabb's Black Burgundy*. From Prof. E. W. Hilgard, Mission San José. The grapes arrived September 19, 1888, and were crushed the following day. They were in good condition except for a little mold due to rain. Juice showed 23.36 per cent of solid contents. Fermentation of 112 pounds crushed started September 20th, and reached its maximum of 93° on the morning of the 22d. On September 24th the murk was pressed. The yield from the above amount was 9.75 gallons, corresponding to 174.11 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. November 2. Taken to cellar; condition not clear enough for racking.

December 10. Racked. A clean-tasted, vinous, and sound wine of advancing bouquet. Lees sound.

1889. January 12. "Was too ripe." (E. W. H. and F. P.)

March 26. Lees show a small quantity of lactic germs; pasteurized.

May 29. Racked again; condition clear.

August 2. Condition bright, with a good red color, but slightly developed bouquet, pleasant flavor, good body, and medium acid, tannin, and alcohol; quality good; stands dilution fairly well.

November 4. Sample in glass spoiled.

1890. February 4. Lees show lactic germs.

February 17. Condition bright; lactic flavor very prominent.

February 23. Racked again.

No. 907 (short-pruned). *Crabb's Black Burgundy*. From J. T. Doyle, Cupertino. The grapes arrived October 12, 1888, in good condition, and were crushed the same day and fermented with No. 908. Coulure varied very much, some bunches had hardly any and others had as much as 40 per cent; dried grapes occurred to the extent of 6 per cent; only a few grapes from short-pruned row. Berries characteristic and sweet, heavy bloom, stems green. Only 14 pounds received. The juice showed 24.71 per cent of solid contents.

No. 908 (long-pruned). *Crabb's Black Burgundy*. From J. T. Doyle, Cupertino. The grapes arrived in good condition. Coulure varied from nothing on some bunches to 35 per cent on others. Bunches medium length with small shoulders; many bunches had raisins. Berries sweet

with heavy bloom; stems green. Juice showed 25.19 per cent of solid contents.

RECORD OF TREATMENT AND TASTING.—Nos. 907, 908, together.—1889. *January 3.* Racked. Wine too turbid to judge of its character; still fermenting slightly.

*January 18.* Taken to cellar.

*March 7.* Racked again; sediment shows small quantities of lactic germs; pasteurized.

*May 14.* Racked; condition clear.

*August 2.* Condition bright, with a good red color, but a slightly developed bouquet, rather pleasant flavor, medium acid, and high astringency and alcohol; quality is good and stands dilution well.

*November 4.* Sample in glass the same as in the keg except that the smell and taste are suspicious.

*November 12.* Wine in the keg is better developed and with more pleasing bouquet than when tasted, August 2d.

1890. *February 10.* Lees show no unsound germs.

*February 25.* Bouquet is much improved; tannin toned down and wine generally matured.

*March 3.* Racked again.

*No. 1115. Crabb's Black Burgundy.* From J. Gallegos, Experimental Plot, Mission San José. The grapes arrived October 1, 1889, and were crushed the following day. They were in good condition, and ripe, many grapes being dry. The bunches, which were medium size, were pyramidal, shouldered, and close. Grapes medium size, and slightly oval; skin thick, but not resistant; flesh firm, juicy, and sweet. Juice showed 25.55 per cent of solid contents. Fermentation of 95 pounds crushed commenced October 3d, attained its maximum of 94° on the following day, and was pressed on the 5th; 7½ gallons were obtained, corresponding to 160.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 3.* Not quite clear, and with a peculiar, not agreeable bouquet; a somewhat bitter and flat taste; low acid; full astringency; general quality not good.

*December 4.* Racked and taken to cellar.

1890. *January 17.* Condition clear; rather dark color; bouquet not good; flavor improved, but still has a slight bitter taste; quality improved since last tasting.

*January 29.* Lees show lactic germs in considerable quantities.

*March 20.* Pasteurized.

*June 1.* The wine has a slightly lactic taste.

*July 3.* The wine has a butyric odor, but seems slightly improved; racked.

*August 4 and December 30.* Lees show some dead lactic germs.

1891. *January 7.* The wine is quite spoiled from lactic fermentation.

*No. 1128. Crabb's Black Burgundy.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 3, 1889, and were crushed the same day. Their condition was good, except that a few bunches were moldy. The bunches were rather small and loose; berries of good size. Juice showed 25 per cent of solid contents. Fermentation of 114½ pounds crushed commenced October 4th, and reached its maximum of 90° on the 6th. Fermentation was completed on October 7th. Half of the amount was then pressed, and the other half put into a keg with half the pomace, for color experiment; 9½ gallons were obtained from the whole amount, corresponding to 159.4 gallons per ton.

RECORD OF TREATMENT AND TASTING.—No. 1128.—1889. *October 30.* Condition nearly clear, with peculiar bouquet; flavor not marked; taste a little flat; normal acid; high astringency and body; general quality fair, but rough.

*November 12.* Racked and taken to cellar.

1890. *January 17.* Condition clear; wine is generally improved, but still flat-tasted. Lees show alcoholic ferment only.

*April 3.* Racked again.

*May 16.* Lees sound.

No. 1128a.—1889. *November 12.* Racked and taken to cellar.

1890. *January 17.* Condition clear, with a deep color, agreeable bouquet and flavor, clean taste and full acid, astringency and alcohol; quality rather good.

*April 2.* Racked again.

*May 15.* Lees show much alcoholic ferment and a few lactic germs.

*June 13.* Wine clear; no bouquet; lactic taste quite noticeable; quality lower than No. 1128.

*August 4 and December 29.* Lees full of lactic germs.

*1891. January 7.* Quite spoiled.

### *Discussion of Results.*

At the Experimental Plot, in Cupertino, the Refosco has shown itself to be a good bearer if pruned long; also the Crabb's Black Burgundy, which, according to Professor Hilgard, is perhaps identical with the Refosco, showed good bearing qualities, but not as heavy as the latter. In fact, in the year 1889, from vines in full production, the crop of the Refosco was at the rate of a little more than 5 tons per acre, while the Crabb's Black Burgundy gave about 4½ tons. Both these varieties at maturity easily attain an average of 25 to 26 per cent of sugar, even in the Santa Clara Valley, this amount having been lower only in case of young vines, and higher in case of overripeness.

As to acidity, the Black Burgundy has for several years been much inferior to that of the Refosco; the proportion of acidity in the former varied from .36 to .49 per cent, and only in one case was as high as .55; while in the latter variety it ranged from .66 to .85 per cent. This difference, which at first sight would constitute a defect in the Black Burgundy, might be disregarded; for while its acidity is still low at pressing, it seems to increase much more during its first year of aging, and to become, in some cases, higher than that of the Refosco. Our analytical record shows from .50 to .66 per cent in the former, and .56 per cent in the latter. However, it is probable that such an increase of the acidity is abnormal, and is due to abnormal fermentations which occur easily in the wine.

In regard to the wine, both varieties make a wine containing 13 per cent of alcohol by volume and from .192 to .321 per cent of tannin, this being a high proportion; but they differ essentially as to color. At pressing, the Black Burgundy has less than half the percentage of the Refosco; and after seven months it is 19 per cent in the former and 60 per cent in the latter. They both make heavy-bodied wines; nevertheless the Black Burgundy has shown itself quite a poor keeper in our cellar, being easily attacked by lactic fermentation, while the Refosco has been found somewhat rough, but will develop by aging and remain sound. It would seem that the Refosco wine can be usefully employed in blending with thin wines of poor keeping qualities; for the blend will have all its good qualities without having its defects, and will constitute a quickly salable wine, especially for local consumption. The Refosco should therefore be propagated more than it has been done so far, and should, at least in part, replace the Crabb's Black Burgundy, which grape, being characterized by a lower acidity, presents more danger for the vinification at a high temperature which so often happens in California. But the Crabb's Black Burgundy can be used for the making of good Port wine; while the Refosco is more adapted for the making of dry wine.

## MARZEMINO.

This variety is especially cultivated in the Venitian region, as well as in southern Tyrol, both for table and wine purposes. It seems that there it produces a good colored wine, which matures early, but is not a very good keeper.

*Description.*—Leaves over average size, smooth and glabrous on upper side, while the lower side is covered with a hairy down; upper sinus marked, that of the petiole very close. Bunches long, conico-cylindrical, winged and loose. Berries average size, spherical, on strong and long pedicels; flesh juicy, sweet, rather pronounced; skin rather thick and tough, dark black, rather pruinose. Maturity, third period.

## ANALYSES OF WINES.

| MARZEMINO.     |                                  |       | MUST.            |                                 |                                |                   |               |
|----------------|----------------------------------|-------|------------------|---------------------------------|--------------------------------|-------------------|---------------|
|                |                                  |       | Date at Picking. | Solid Contents by Spindle . . . | Sugar by Copper Test . . . . . | Acid as Tartaric. | Ash . . . . . |
| 1889—No. 1156. | J. T. Doyle, Cupertino.          | ----- | Oct. 9           | 23.60                           | -----                          | .43               | -----         |
| No. 1181.      | John Gallegos, Mission San José. | ----- | Oct. 12          | 25.90                           | -----                          | .43               | -----         |
| 1890—No. 1231. | Margherita Vineyard, Fresno.     | ----- | Aug. 22          | 23.41                           | 23.61                          | .38               | .33           |
| No. 1293.      | J. T. Doyle, Cupertino.          | ----- | Oct. 1           | 21.10                           | -----                          | .89               | .28           |
| No. 1358.      | John Gallegos, Mission San José. | ----- | Oct. 11          | 23.05                           | -----                          | .71               | -----         |

In both seasons, only quantities sufficient for must analysis were obtained. High acidity seems to characterize this grape, like others from northern Italy; however, it seems that it loses this quality when grown in the hot and dry climate of Fresno. Doubtless it must be tried for a longer time to ascertain its special qualities in California.

*No. 1156. Marzemino.* From J. T. Doyle, Cupertino. Only a few bunches were received on October 10, 1889, and they corresponded to Odart's description. Bunches large, irregular, conical, shouldered, rather compact; grapes medium-sized and round; skin dark colored, but tough; flesh rather firm and juicy; stems long, strong, and woody; pedicel rather short and slender. Condition good; maturity complete. Juice showed 23.60 per cent of solid contents.

*No. 1181. Marzemino.* From J. Gallegos, Mission San José. Only a few bunches of this variety were received on October 15th in good condition. They agree well with the above description. Juice showed 25.9 per cent of solid contents.

## ALEATICO.

This variety, which is originally from Tuscany, is now found in almost all the European vineyards, being much esteemed as a table grape and in the making of *vins de liqueur*. In Italy, it is frequently mixed with other varieties, in order to communicate its pleasant Muscat flavor to the wines. The vine is of a fair vigor and productiveness; stony soils and short pruning seem to suit it rather best; as it matures late, it

requires a warm exposure and dry weather; it must be grown in localities not much subject to the rain in autumn, for the grapes would be deteriorated very easily.

*Description.*—Leaves average size, three-lobed, the upper side of a fine light green, the lower side green and paler. Bunches compact, conical, shouldered. Berries unequal, round; skin thin and of a dark-red color; flesh juicy and sweet, with a pleasant Muscat flavor.

## ANALYSES OF WINES.

| ALEATICO.                                 | 1888.                        | 1890.      |
|-------------------------------------------|------------------------------|------------|
|                                           | John T. Doyle,<br>Cupertino. |            |
|                                           | No. 930.                     | No. 1368.  |
| Date of picking.....                      | Oct. 22.                     | Oct. 15.   |
| <i>Must</i> —                             |                              |            |
| Solid contents by spindle.....            | 27.24                        | 29.50      |
| Acid as tartaric.....                     | .32                          | .74        |
| Ash.....                                  | .45                          |            |
| <i>Wine</i> —                             |                              |            |
| Alcohol { By weight.....                  | 11.62                        | } No wine. |
| { By volume.....                          | 14.50                        |            |
| Tannin.....                               | .225                         |            |
| Total acid as tartaric { At pressing..... | .54                          |            |
| { At eight months.....                    | .66                          |            |
| Body.....                                 | 3.10                         |            |

## Color of the Wine No. 930.

|                              |      |                |
|------------------------------|------|----------------|
| At pressing, October 27..... | 43.5 | 2 V. R.        |
| One month.....               | 25.5 | 3 V. R.        |
| Three months.....            | 23.5 | 5 V. R.        |
| Four months.....             | 23.5 | 5 V. R.        |
| Seven months.....            | 20.0 | 1 V. R. + 1 Y. |

*No. 930. Aleatico.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 24, 1888, and were crushed the same day. Their condition was fair, but overripe, with heavy coulure. Every bunch had raisins or half-dried berries in it; the stems were green. The juice showed 27.24 per cent of solid contents. Fermentation of 23 pounds crushed started October 25th, and reached its maximum of 87.8° on the next day. On the 27th it was pressed, yielding from the above amount 1.32 gallons of wine, corresponding to 152.53 gallons per ton.

**RECORD OF TREATMENT AND TASTING.**—1888. *November 22.* Racked and taken to the cellar (sample in glass). A clean-tasted wine of little bouquet, as yet.

1889. *April 2.* Racked again; the wine is clear, with a Muscat flavor, but a slight bitter taste; still fermenting slightly; lees show much bitter ferment; pasteurized.

*June 1.* Racked again; a clear but bitter wine.

*August 7.* Condition bright, with a dark-red color; very marked bouquet, resembling Muscat; an entirely bitter flavor; good body; medium acid and alcohol and full tannin; quality injured by bitterness; stands dilution well.

*November 4.* (Half-gallon demijohn.) Has a less bitter taste than on August 7th.

1890. *March 10.* Wine still bitter.

1891. *March 2.* Wine completely spoiled by bitterness.

Under the conditions in which this test was made, it can have but little weight in forming an estimate of the value of this grape for culture in California. Evidently the grapes were tainted with bitter ferment and prevented any correct judgment of its quality. It is hoped that Mr. Doyle will continue the experiment with the culture of the Aleatico.

#### 4. SOUTHERN FRENCH TYPE.

The wines of this type cannot be compared with those of the Bordeaux, the Burgundy, or the North Italian regions, for they are mostly destined for brandy and the large trade. However, among this class there are still some which are considered as wines of fine quality.

The medium quality of the wines of the large trade are obtained from the Aramon, Carignane, Aspiran (Verdal), Grenache, Oeillade, Bouschet's varieties, etc., while those of fine quality are obtained from the Sirah, the Mondeuse, the Terret Noir, the Aspiran, the Oeillade, the Mataro, the Mourastel, the Piquepoul, and some others, if grown on hill locations.

On account of the numerous kinds of wines that so many varieties produce, it is impossible to assign a special, uniform character to this type. They vary greatly from one district to another, even when the wines are obtained from the same grapes. With the exception of a few of them, such as the Sirah, we may say that as a rule they are heavy and coarse wines, of poor keeping qualities, and which are especially used for prompt consumption, or for blending purposes with thin and medium class of wines from other regions, supplying to them the tannin, color, and alcohol in which the latter are deficient. The color is principally supplied by the several varieties obtained by Bouschet. This type of wines is comparable with the various dry red wines produced in the other viticultural countries of southern Europe.

Our report, which gives an account of our experience with several of the grape varieties of southern France, can guide the grape-grower as to their selection for the different localities of the State, and their use in wine-making.

##### ARAMON.

The Aramon is one of the long-cultivated varieties of southern France, where it now occupies a large area, on account of its great productiveness on fertile soils, this vine having the peculiarity that its product is proportioned to the condition of the soil, both in quality and quantity. On dry, stony hill soils it will yield a moderate amount of excellent wine of good keeping qualities; in rich valleys, a very large quantity of low quality, of very light tint, and best adapted to rapid local consumption; hence, in general, it is not esteemed a good blending wine. The color of its wines is never deep, but of a lively red shade. The vine is always pruned short, and the fruit ripens late. It is easily damaged by frosts and powdery mildew, but it withstands rather well the attacks of the downy mildew; it is liable to injury from sunburn, and in general is rather short lived.

This variety is usually blended in France, in the proportion of one half to one third, with the Carignane, and with other varieties, such as



the Mataro, the Mourastel, and the Malbeck; this blending makes a good wine, of better keeping qualities than the Aramon alone. The leaves of this variety are of medium size, dentate, three-lobed, not deeply cut, rather smooth, slightly woolly on the lower surface; their color is greenish-yellow, and they are supported by a petiole of light-red color; late in the season they often become yellow, and sometimes they redden here and there on the border, some branches redden even entirely. The bunches are large and long, nearly cylindrical in shape, supported by a long peduncle which is rather herbaceous than woody. Their berries are large and round, and very juicy, very sweet, with a pronounced flavor; of a reddish-black color, somewhat velvety, on the hillside locations, and lightly red in other locations. According to Marès, the side of the bunch that does not have the sunshine remains green, while, however, the juice becomes sweet.

TABLE OF PRODUCTION.

| ARAMON.                                                                      | Number of Vines.. | Total Weight of Grapes, in lbs.... | Average per Vine, in lbs. .... | Date of Picking... |
|------------------------------------------------------------------------------|-------------------|------------------------------------|--------------------------------|--------------------|
| 1887—No. 729 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino.....   | 20                | 145                                | 7.5                            | Oct. 13            |
| 1888—No. 955 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino.....   | 19                | 130                                | 6.8                            | Nov. 7             |
| 1889—No. 1189 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino..... | 20                | 190                                | 9.5                            | Oct. 7             |



## COLOR READINGS.

| ARAMON.                 | 1887.                   |              | 1888. | 1889.                          |                                            |
|-------------------------|-------------------------|--------------|-------|--------------------------------|--------------------------------------------|
|                         | J. T. Doyle, Cupertino. |              |       | J. Gallegos, Mission San José. | J. T. Doyle, Experimental Plot, Cupertino. |
|                         | No. 729.                | No. 955.     |       | No. 1175.                      | No. 1189.                                  |
| At pressing { Date----- | Oct. 21.                | Nov. 13.     |       | Oct. 20.                       | Oct. 22.                                   |
| Color-----              | 25.0 2 V. R.            | 44.4 2 V. R. |       | 38.0 4 V. R.                   | 18.5 2 V. R.                               |
| One month-----          |                         | 21.6 2 V. R. |       | 20.0 4 V. R.                   | 12.7 5 V. R.                               |
| Two months-----         | 11.5 5 V. R.            |              |       |                                |                                            |
| Three months-----       |                         | 15.4 4 V. R. |       | 3.3 2 R.+1 Y.                  | 7.40 1 R.                                  |
| Four months-----        | 7.3 2 R.                | 14.9 4 V. R. |       |                                | 7.0 3 R.                                   |
| Five months-----        |                         |              |       |                                | 7.0 3-4 R.                                 |
| Six months-----         |                         |              |       |                                | 6.4 1 V. R.+1 Y.                           |
| Seven months-----       | 9.3 2 R.                | 14.0 R.      |       |                                |                                            |

*No. 729. Aramon.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 14, 1887, and were crushed the same day. Their condition was fair, some good, some very large bunches, and berries very characteristic; few bunches with dried berries; very little coulure, taste very watery, not very sweet, and quite acid. Will make a fair sample of wine of its kind. The juice showed 21.60 per cent of solid contents. Fermentation of 98.25 pounds crushed, began on day of crushing, reached its maximum of 82° on October 17th. It was drawn off on October 20th, six days from crushing. The yield from the above amount was 8½ gallons, or at the rate of 168 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 8.* Racked the young wine from the lees.

*December 20.* No bouquet, moderate acid, light body, and very light astringency; wine apparently sound but empty.

*December 21.* Racked and pasteurized for safety.

1888. *February 9.* Condition, only clear, with faint bouquet and imperceptible astringency; wine thin but not unpleasant.

*May 5.* A thin but passable wine with no merit; with faint bouquet; only fit for blending.

*June 11.* Condition bright, with very light color, and a bouquet not developed to any extent; medium acid; pasteurizing has not injured the taste of the wine. Not much of a wine as it stands. Racked again.

1889. *January 12.* "Sample sound; should be bottled." (E. W. H.)

*November.* A good clear wine, light colored, with a pleasant but not entirely clean bouquet; taste clean and smooth.

*No. 955. Aramon.* From J. T. Doyle, Experimental Plot, Cupertino. Grapes arrived on November 9, 1888, in good condition, and were crushed the same day. Both early and late coulure affected the crop; bunches loose; berries very uneven in size; stems drying out. The juice showed 22 per cent solid contents. Fermentation of 114.5 pounds crushed began on November 10th, and reached its maximum of 88° on the following day. The murk was drawn off on November 13th, four days from crushing. The yield from the above amount was 8½ gallons, or at the rate of 155.1 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 18.* Racked and taken to cellar.

1889. *January 9.* Wine clear, of good bouquet and acid; a better wine than we have made from this variety in former years.

*January 12.* "Quite a fair wine, neutral, and evidently good for dilution of our heavy reds." (E. W. H. and F. P.)

*March 14.* Lees show some lactic germs; pasteurized the wine.

May 29. Racked again; wine clear and sound.  
 August 6. A good, bright wine, with a pleasant and agreeable bouquet and flavor.  
 1890. February 11. Lees sound.  
 February 16. A bright, agreeable, and well-matured wine.  
 March 5. Racked again.  
 July 20. Lees sound, still very good; mature.  
 August 13. Bottled.

No. 1175. *Aramon*. From J. Gallegos, Mission San José. This variety arrived October 16, 1889, and was crushed the same day. Juice showed 22.15 per cent of solid contents. The grapes were in fair condition and quite ripe. Bunches large, cylindrical, shouldered, and loose; grapes large and round, skin thin and tender; color black, with a reddish tint; flesh crisp and juicy, taste sweet and agreeable; stems red, thick, and strong; pedicels long and thick. Fermentation commenced October 16th, and attained its maximum of 86° on the 18th. The murk was drawn off October 19th, three and a half days from crushing, being quite dry. From 52½ pounds crushed 4.62 gallons were obtained, or at the rate of 175.35 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. November 25. Racked and taken to cellar. Condition not quite clear, with light color, very good bouquet, full acid, full and medium alcohol and tannin; general quality good.

1890. January 24. Clear, but not developed since last tasting. Lees show no unsound germs.

April 3. Racked again.

May 15. Lees show an abundance of acetic and a few lactic germs.

May 31. Pasteurized the wine.

June 13. Clear, almost colorless, but with good bouquet and flavor.

July 31. Lees sound.

September 11. Not quite clear, rather flat; racked.

December 30. Lees sound.

1891. January 7. A little past maturity.

February 13. Wine bottled May 31, 1890, lactic; that bottled September 11, 1890, equal to, or better, than that in kegs. Wine in keg bottled.

No. 1189. *Aramon*. From J. T. Doyle, Cupertino. Grapes arrived October 18, 1889, in rather crushed condition. Both bunches and grapes were extremely large. They were crushed on the day of arrival. Juice showed 21.50 per cent of solid contents. Fermentation commenced October 19th, and reached its maximum of 84° on October 20th. The murk was drawn off October 22d, four days from crushing, being still a little sweet. From 97.5 pounds were obtained 8.44 gallons, or at the rate of 173.08 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. December 9. Racked and taken to cellar. A good, light-colored wine, still turbid, with a very marked and pleasing bouquet and flavor.

1890. January 24. A clear, rough, but well-advancing wine. Lees show some lactic germs.

May 6. Wine tastes clean and smooth. Racked again.

May 15. Lees show some long filaments of lactic ferment.

May 25. Pasteurized the wine.

June 12. Clear, little color, good, but rather flat.

August 5. Lees show dead lactic and a little acetic ferments.

September 4. Bright, tastes clean and sound. Racked.

December 30. Lees show a few filiform germs.

1891. January 2. Bright; a smooth, pleasant wine, but somewhat thin.

February 17. Wine bottled September 4, 1890, quite sound and good; equal to that in keg. Wine in keg bottled.

### Discussion of Results.

From the above record it appears that the *Aramon* is a good bearer when pruned short, in fact at the Cupertino Experimental Plot, in the year 1889, the yield was at the rate of about 3.18 tons, against 2.51 and

2.27 tons per acre for the long-pruned vines of the seasons 1887 and 1888. The grapes on short-pruned vines matured before those on the long-pruned. The must contains on the average from 22 to 23 per cent of sugar, and in general is deficient in acidity.

The wine obtained at the Experimental Cellar contains about 11 per cent of alcohol by volume, is deficient in acidity, of good astringency, of light color, and on the whole, somewhat thin; it has, however, a pleasant bouquet and flavor, a neutral taste, which makes it recommendable for the dilution of our heavy reds; it has also proved to be a rather good keeper. But if the Aramon is planted in good upland locations, and care is taken to prevent the different diseases by which it is easily attacked, we can expect to make from it a wine of better quality than that thus far obtained. The yield of the berries in juice is remarkable, being the highest average thus far observed, and will of course make up to some extent for any deficiency in the aggregate weight of a crop.

#### CARIGNANE.

This variety is vigorous and rather productive, but it is easily injured by the powdery mildew (*oidium*) and the downy mildew (*peronospora*), and by late frosts. It prefers hill locations and heavy clayey soils, and a south exposure. Its wine is deeply colored, alcoholic, rather smooth, but coarse while young, and requires much care in finishing. It improves in quality when blended with the Mataro, the Pinots, and even the Aramon.

The Carignane has found considerable acceptance in California, especially as a useful blend for Zinfandel. It has been found very satisfactorily productive under the short-pruning system, and seems to adapt itself well to a great variety of soils. The French reputation of its wine, above mentioned, seems to be sustained in California thus far.

## ANALYSES OF WINES.

|                 | CABIGNANE.     | MUST.                        |       |                         |     | WINE.                           |       |                         |      |                       |  |           |      |            |    |           |  |
|-----------------|----------------|------------------------------|-------|-------------------------|-----|---------------------------------|-------|-------------------------|------|-----------------------|--|-----------|------|------------|----|-----------|--|
|                 |                | Date of Picking.....         |       |                         |     | Solid Contents* by Spindle..... |       | Sugar by Copper Test... |      | Acid as Tartaric..... |  | Ash ..... |      | Body ..... |    | Ash ..... |  |
|                 |                |                              |       |                         |     |                                 |       |                         |      |                       |  |           |      |            |    |           |  |
|                 |                |                              |       |                         |     |                                 |       |                         |      |                       |  |           |      |            |    |           |  |
| Alcohol.        |                | Tannin.....                  |       | Total Acid as Tartaric. |     | Volatile Acid.....              |       |                         |      |                       |  |           |      |            |    |           |  |
| By Weight ..... | By Volume..... |                              |       |                         |     | At Six to Eight Months.....     |       |                         |      |                       |  |           |      |            |    |           |  |
|                 |                |                              |       |                         |     |                                 |       |                         |      |                       |  |           |      |            |    |           |  |
| 1882—           | No. 128a.      | H. A. Pellet, St. Helena*    | 19.87 | 20.24                   | .68 | 41                              | 9.63  | 12.00                   | 160  | 53                    |  |           | 2.18 | 2.30       | 23 |           |  |
| No. 188.        | No. 128.       | J. P. Smith, Livermore ..    | 22.67 | 22.67                   | .68 | 33                              | 8.48  | 10.90                   | .063 | .67                   |  |           | 2.01 | 2.36       | 36 |           |  |
| No. 87.         | No. 127.       | J. B. J. Portal, San José*   | 19.03 | 19.03                   | .59 | 29                              | 9.27  | 11.54                   | .060 | .46                   |  |           | 2.06 | 2.40       | 43 |           |  |
| No. 127.        | No. 127.       | M. Denicke, Fresno*          | 23.20 | 23.32                   | .74 | 35                              | 8.84  | 11.00                   | .073 | .45                   |  |           | 1.93 | 2.40       | 40 |           |  |
| 1894—           | No. 219.       | M. Denicke, Fresno*          | 23.20 | 23.32                   | .74 | 35                              | 9.92  | 12.36                   | .100 | .47                   |  |           | 2.18 | 2.38       | 37 |           |  |
|                 | No. 219.       | Natoma Company, Natoma       | 23.20 | 23.32                   | .74 | 35                              | 7.92  | 9.90                    | .063 | .48                   |  |           | 2.04 | 2.18       | 28 |           |  |
| 1886—           | No. 511.       | A. Salazar, Mission San José | 23.20 | 23.32                   | .74 | 35                              | 9.27  | 11.55                   | .172 | .69                   |  |           | 2.18 | 2.30       | 37 |           |  |
| No. 623.        | No. 591.       | Margherita Vineyard, Fresno* | 23.20 | 23.32                   | .74 | 35                              | 18.84 | 11.00                   |      | .56                   |  |           | 2.30 | 2.30       | 44 |           |  |
| No. 591.        | No. 591.       | J. T. Doyle, Cupertino*      | 23.20 | 23.32                   | .74 | 35                              | 9.98  | 12.46                   | .203 | .65                   |  |           | 2.80 | 2.80       | 44 |           |  |
| 1887—           | No. 787.       | A. Salazar, Mission San José | 23.20 | 23.32                   | .74 | 35                              | 7.78  | 9.73                    | .131 | .48                   |  |           | 2.90 | 2.90       | 33 |           |  |
| No. 711.        | No. 711.       | J. T. Doyle, Cupertino ..    | 25.75 | 25.19                   | .53 | 24                              | 10.07 | 12.54                   | .298 | .54                   |  |           | 3.20 | 3.20       |    |           |  |
| No. 684.        | No. 684.       | Margherita Vineyard, Fresno  | 22.36 | 20.94                   | .60 | 42                              | 9.06  | 11.27                   | .205 | .32                   |  |           | 2.60 | 2.60       |    |           |  |
| 1889—           | No. 1070.      | A. Caminetti, Jackson ..     | 22.10 | 21.57                   | .45 | 45                              | 8.84  | 11.00                   | .220 | .55                   |  |           | 2.60 | 2.60       |    |           |  |
| 1890—           | No. 1251.      | Margherita Vineyard, Fresno  | 26.10 | 25.76                   | .44 | 20                              | 11.92 | 14.60                   | .391 | .50                   |  |           | 3.07 | 3.07       |    |           |  |
| No. 1335.       | No. 1335.      | J. T. Doyle, Cupertino ..    | 20.60 | 19.89                   | .74 | 41                              | 8.91  | 11.09                   | .125 | .56                   |  |           | 2.36 | 2.36       |    |           |  |
|                 | No. 1335.      | J. T. Doyle, Cupertino ..    | 21.50 | 21.50                   | .72 | 72                              |       |                         |      |                       |  |           |      |            |    |           |  |

## COLOR READINGS.

|                    | 1886.                               |                            | 1887.                              |                            | 1889.                               |
|--------------------|-------------------------------------|----------------------------|------------------------------------|----------------------------|-------------------------------------|
|                    | A. Salazar,<br>Mission<br>San José. | J. T. Doyle,<br>Cupertino. | Margherita<br>Vineyard,<br>Fresno. | J. T. Doyle,<br>Cupertino. | A. Salazar,<br>Mission<br>San José. |
|                    | No. 511.                            | No. 591.                   | No. 684.                           | No. 711.                   | No. 787.                            |
| At pressing { Date | Oct. 11.                            | October.                   | Sept. 30.                          | Oct. 17.                   | Nov. 7.                             |
| One month { Color  | 30.3 2 V. R.                        | -----                      | 13.3 4 V. R.                       | 30.7 V. R.                 | Sept. 24.                           |
| Two months         | 28.0 2 V. R.                        | -----                      | -----                              | -----                      | 39.6 2 V. R.                        |
| Three months       | -----                               | -----                      | -----                              | 30.0 1 V. R.-V. R.         | 28.7 5 V. R.                        |
| Four months        | 30.3 2 V. R.                        | 35.6 2 V. R.               | 11.4 5 V. R.                       | 6.6 2 R.                   | 18.1 1 R.                           |
| Five months        | -----                               | -----                      | 5.9 4 R.                           | -----                      | 17.6 R.                             |
| Six months         | 26.0 1 V. R.                        | -----                      | -----                              | 8.0 1 R.                   | 17.6 R.                             |
| Seven months       | -----                               | -----                      | 5.0 O. R.                          | -----                      | -----                               |
| Eight months       | 20.0 3 V. R.                        | -----                      | -----                              | -----                      | -----                               |

## CARIGNANE EXPERIMENTAL FERMENTATION, 1887.

|                            | No. 787.  | No. 788.          | No. 789.          | No. 790.          | No. 791.          | No. 792.          |
|----------------------------|-----------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Color at twenty-six months | 16.0 2 R. | 14.3 1 V. R.+1 Y. | 17.0 2 V. R.+1 Y. | 13.4 V. R.+1 Y.   | 15.6 1 V. R.+1 Y. | 15.5 3 V. R.+1 Y. |
|                            |           | No. 793.          | No. 795a.         | No. 796.          | No. 797.          | No. 797b.         |
| Color at twenty-six months | -----     | 14.7 2 V. R.+1 Y. | 11.4 2 R.+1 Y.    | 16.5 1 V. R.+1 Y. | 9.6 2 R.+1 Y.     | 11.6 1 R.+1 Y.    |

*No. 684. Carignane.* From Margherita Vineyard, Fresno. The grapes arrived on September 21, 1887, and were crushed the same day. They were only in a fair condition, having been gathered six days before, and remained at Fresno depot several days; still, they were worked after picking over, none being moldy, but some fermented. The berries were slightly dried, most of the stems entirely so. Berries large and juicy. The juice showed 22.10 per cent of solid contents. Fermentation of 134 pounds of grapes crushed, began the same afternoon, reached its maximum of 78° on the morning of September 24th; remained at that temperature until the 27th. On September 30th the muck was drawn off, nine days from crushing. The yield from the above amount was 11 gallons, or at the rate of 164 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 19.* Condition bright, with high astringency, sharpish acid; odor a little dubious, possibly of milk-sourness. A microscopical examination of the sediment shows much effete yeast, lactic germs in long filaments, and a very little acetic ferment.

1888. *January 19.* Racked the wine.

*February 9.* A wine with sharpish acid and rather thin body, requiring blending to make it pleasant; very astringent—unusually so for a light wine.

*February 11.* Racked and pasteurized the wine.

*March 12.* Condition bright, with light port color, fairly developed and pleasant bouquet, marked astringency, pleasant acid, lightish body.

*May 5.* Bouquet faint but pleasant; acid full, and not unpleasant; wine lacks character.

*June 4.* The microscope still shows lactic ferment in the sediment. As it was evidently deteriorating it was discarded.

*No. 711. Carignane.* From J. T. Doyle, Cupertino. The grapes arrived October 11, 1887, and were crushed the same day. Their condition was good; bunches well packed and little coulure, but berries not quite as large as at Mission San José, and somewhat uneven in size. The juice showed 22.94 per cent of solid contents. Fermentation of 105 pounds crushed began on the morning of October 12th, and reached its maximum of 80° on the evening of the 14th, being very violent on that and the previous day. The wine was drawn off on October 17th, six days from crushing, yielding 8½ gallons, or at the rate of 159 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 13.* A bright, well-colored wine, well advanced, dry and sound.

1888. *January 26.* Racked the young wine from the lees.

*February 8.* Condition bright, with medium acid and moderate astringency; an advanced, pleasant, but rather thin-bodied wine.

*June 20.* Condition bright, with light garnet color, low acid, well-developed bouquet, and pronounced astringency. A thin but pleasant wine. The sediment shows, under the microscope, only traces of lactic germs. Racked and pasteurized for safety.

*No. 787. Carignane.* (This number represents the first sample of the series 787–797b of the experimental fermentations made with the Carignane, in the season 1887. For detailed record and discussion on the latter, read "Reports of Experiments on Methods of Fermentation and Related Subjects," by Prof. Hilgard, which can be had on application.) From A. Salazar, Mission San José, who very generously donated 2,290 pounds of very fine grapes for experimenting with the different methods of fermentation. The grapes arrived November 1, 1887, in good condition, having been picked the day previous; all in crates. Full ripe, a few overripe and flabby; a few dried and unripe berries. Stems green throughout, a few partly dried, or rather wilted; a few bunches with unsound berries from having rested on the ground, but



the whole in such condition as to make a perfectly fair test of the grapes; the latter very sweet. The juice showed 25.75 per cent of solid contents. The murk was drawn off on November 7th, 138.5 hours from crushing. The yield from 200 pounds crushed was  $16\frac{1}{2}$  gallons, or at the rate of 160.6 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *November 22.* Condition almost clear, tastes sound.

*December 20.* Bouquet advancing, a well-tasted wine.

1888. *February 6.* Bouquet well developed, a sound wine.

*February 23.* The wine was racked from the lees.

*March 12.* Condition bright, with a deep, purple color; fairly developed, markedly vinous bouquet. A good, but heavy wine; needs blending.

*May 4.* Acid apparently unchanged, still as good a wine as the series presents, if not the best, but requires blending.

*June 13.* The acid has increased somewhat. The microscopical examination of the sediment does not show any ferments of disease.

*June 14.* Racked the wine and pasteurized it for safety, as the analysis shows, at this time, 22 per cent of volatile acid.

*July 11.* Condition bright, with a well-advanced bouquet, a somewhat sharp acid; but otherwise the wine is smooth and well proportioned.

*No. 1070. Carignane.* From A. Caminetti, Jackson, Amador County. Corresponds to Rendu's account of the grape. Bunches heavy and close; grapes unequal in size and color, the latter being poor; condition very good; maturity complete. The grapes arrived September 16, 1889, and were crushed the following day. Juice showed 26.1 per cent of solid contents. Fermentation of 146 pounds commenced very slowly, not being perceptible till September 19th, when the temperature had reached 72.5°. The maximum of 85° was observed on September 21st; the wine continued to ferment slowly, and was drawn off September 24th, seven days from crushing. On September 26th the wine showed 8 per cent of solid contents. The yield from the above amount was 11.75 gallons, corresponding to 161 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 6.* Racked and taken to cellar.

1890. *January 27.* Bright, with a fair color, a cooked bouquet and flavor, clean taste, very high astringency and full alcohol, and body full; quality, a very heavy, coarse wine, but sound, and without any unpleasant flavor, except the cooked taste. Lees free from bad germs.

*May 2.* A bright and sound wine; racked.

*May 16.* A microscopical examination of the lees shows no unsound germs.

*June 9.* Bright and sound, but still rough, though the cooked taste is not so pronounced.

*July 31.* Lees sound.

*December 30.* Lees show a few lactic germs.

1891. *January 2.* Lactic taint not perceptible to taste; a strong, rough wine, of good flavor but no bouquet.

*March 16.* Racked; some wine bottled.

*August 25.* Wine in keg bottled.

### *Discussion of Results.*

The following summary of data regarding the Nos. 684 and 711 will prove interesting as illustrating the differences in the same grape from two widely different climatic localities:

## COMPARATIVE SUMMARY OF DATA OF CARIGNANE FROM J. T. DUTLE, CUPERTINO, AND FROM MARGHERITA VINEYARD, FRESNO.

|                                      | J. T. Dutle, Cupertino. | Margherita Vineyard, Fresno. |
|--------------------------------------|-------------------------|------------------------------|
|                                      | No. 711.                | No. 684.                     |
| Room temperature .....               | 72-75 degrees.          | 72-75 degrees.               |
| Mode of fermentation .....           | Floating cover.         | Floating cover.              |
| Time of fermentation .....           | 144 hours.              | 240 hours.                   |
| Solid contents .....                 | 26                      | 26                           |
| Temperature of mash at setting ..... | 66 degrees.             | 62 degrees.                  |
| Maximum temperature .....            | 80 degrees.             | 78 degrees.                  |
| Hours from setting .....             | 75 hours.               | 138 hours.                   |
| Tannin .....                         | 206 per cent.           | 220 per cent.                |
| Acid at pressing .....               | 52 per cent.            | 55 per cent.                 |
| Acid, May 25th .....                 | 43 per cent.            | 66 per cent.                 |
| Maximum color .....                  | 30.7 per cent V. R.     | 13.3 per cent 4 V. R.        |
| Time of extraction .....             | 144 hours.              | 240 hours.                   |
| Color, February 6, 1888 .....        |                         | 5.9 per cent 4 R.            |
| Color, June 15th .....               | 8 per cent 1 R.         | 5 per cent Orange.           |
| Total decrease from maximum .....    | 74 per cent.            | 62.3 per cent.               |

## ANALYSES.

|                        | No. 711.        | No. 684. |
|------------------------|-----------------|----------|
| <b>Must—</b>           |                 |          |
| Sugar by spindle ..... | 22.94 per cent. | 22.10    |
| Acid .....             | .60 per cent.   | .45      |
| <b>Wine—</b>           |                 |          |
| Alcohol ; Volume ..... | 11.27 per cent. | 11.00    |
| ; Weight .....         | 9.06 per cent.  | 8.84     |
| Body .....             | 2.60 per cent.  | 2.60     |
| Tannin .....           | 206 per cent.   | 220      |
| Acid .....             | .43 per cent.   | .66      |

It will be noted that the two batches of grapes had very nearly the same solid contents, and were fermented under as nearly the same conditions as possible. But the Fresno grape had only three fourths as much acid as that from Cupertino, although somewhat less sugar; its maximum color was less than half of that in the Cupertino sample, although the tannin was higher. The latter two differences appear to be altogether general in the same direction, when we compare grapes of the same variety. Again, the tint of the Fresno grape was, from the beginning, and remained, far more in the direction of Port (orange-red) tints than the other, and the final tint was less intense in the ratio of 5 to 8.

As regards fermentation, it took the Fresno grape 100 hours more than the Cupertino grape to ferment dry, and in doing so it had acquired over 2 pro mille more of acid, evidently foreign to the grape. It showed lactic ferment from the outset and the development of the latter could not be checked by pasteurization, so that in June it had to be discarded as useless, while the Cupertino sample showed a normal development. There can be little doubt that the Carignane is not a variety to be cultivated in the Fresno region unless it be for Port, for which use, however, its character fits it but poorly.

The characteristics of the Carignane grapes from Amador are: A higher percentage of sugar and a lower proportion of acidity than the same from Fresno, Mission San José, and Cupertino. Its wine is the most alcoholic of the series, and also the less acid, with the exception of No. 711 from Cupertino, which has very nearly the same amount of acidity. Tannin is in a very high proportion, viz.: .391 per cent, which represents the highest one of the series. In regard to body, it ranks next to the sample No. 787 from Mission San José, being 3.07 per cent, but is higher than in Nos. 711 and 684 from Cupertino and Fresno. The color is higher than that of the samples from Cupertino and Fresno, but lower than that from Mission San José. The wine is very coarse, and has a cooked taste; however, it proves to be a good keeper. Perhaps, by a proper blending, the Carignane produced in Amador County may reach a good quality.

SIRAH (PETITE SIRAH, SYRAC, SÉRINE, ETC.).

The Sirah, like the Mondeuse, is most largely cultivated in southeastern France, from the region of Lyons southward beyond Valence; but it is also grown more or less on the Côte d'Or and in the Bordelais. It forms, in blends with white grapes like the Marsanne, Roussanne, Viognier, etc., a large ingredient of the high-grade red wines of Hermitage, Côte Rôtie, and other localities. It is a vigorous vine, of good productiveness; is mostly pruned long, or half-long, but is sometimes nearly as productive as the Mondeuse even when short-pruned.

From Natoma, the Sirah was reported to be (long-pruned) a very fair bearer, and medium ripening, a little later than the Mondeuse. This is the reverse of what is stated in this regard from France, where the Mondeuse ripens between the second and third epoch, while the Sirah is of the second. On the contrary, at Mission San José and Cupertino this variety ripens at about the same time as the Mondeuse, or a short time before, and at Fresno it matures very early. It resists powdery mildew well, but is easily injured by coulure. Its characters are the following: Leaves medium or above medium size, glabrous on the upper surface, slightly downy on the lower, and rather deeply sinuate; bunches rather large, conical, with ellipsoidal berries, somewhat loose; berries black, and pruinose at the time of maturity. The skin of the berries is more tender than that of the Mondeuse, and the grape would not bear transportation or keep as well as the latter.

The Sirah is still quite rare in California, but in those localities of the State in which it has been cultivated it has given heavy-bodied, alcoholic, and deep-colored wines, which possess a very pronounced bouquet. It has, however, been observed that its wine, particularly when grown in a warm climate, contains some undecomposed sugar, which is quickly transformed into lactic acid, and we therefore think that the Sirah should mostly be used in small quantity for blending, in the proportion of not more than one fifth to one tenth, with dry and hardy wines, as those of the Mataro, Malbeck, Cabernet, and even the Mondeuse and the Aramon. But the blend with the Grenache or the Carignane, whose wines are too smooth, should be avoided.

It has been stated several times in California that Sirah and Sérine were two distinct varieties, for their growth, their crops, and their products have been found somewhat different. Such differences are

simply due to the nature of the soil and to selection of the cuttings, for this variety degenerates easily, so as to make it seem that there are two different varieties, while in reality they are identical. In France, also, the same thing was observed, but the matter has long been settled, and they are recognized as a single variety. These are phenomena which occur frequently in cultivated plants, and in which the nature of the soil plays the largest part. In Italy we observe the same changes on the Nebbiolo, which is grown under the names of Chiavennasca and Spanna in other localities of Piedmont, and shows a different growth in each location, and produces three distinct types of wine.

TABLE OF PRODUCTION.

| SÉRINE AND PETITE SIRAH.          |                                           | Number of Vines | Total Weight of Grapes, in lbs. | Average per Vine, in lbs. | Date of Picking. |
|-----------------------------------|-------------------------------------------|-----------------|---------------------------------|---------------------------|------------------|
| Petite Sirah—                     |                                           |                 |                                 |                           |                  |
| 1887—No. 739 (long-pruned).       | J. T. Doyle, Experimental Plot, Cupertino | 20              | 63                              | 3.2                       | Oct. 14          |
| 1888—No. 890 (short-pruned).      | J. T. Doyle, Experimental Plot, Cupertino | 20              | 80                              | 4.0                       | Oct. 8           |
| No. 891 (long-pruned).            | J. T. Doyle, Experimental Plot, Cupertino | 20              | 108                             | 5.4                       | Oct. 8           |
| 1889—Row 22                       | J. T. Doyle, Experimental Plot, Cupertino | 40              | 225                             | 5.6                       | Sept. 20         |
| Sérine—                           |                                           |                 |                                 |                           |                  |
| 1887—No. 767 (long-pruned).       | J. T. Doyle, Experimental Plot, Cupertino | 20              | 36                              | 1.8                       | Oct. 20          |
| 1888—No. 920 (long-pruned).       | J. T. Doyle, Experimental Plot, Cupertino | 20              | 135                             | 6.8                       | Oct. 18          |
| 1889—No. 1147 (half-long-pruned). | J. T. Doyle, Experimental Plot, Cupertino | 19              | 200                             | 10.5                      | Oct. 8           |

## ANALYSES OF WINES.

|                | PETITE SIRAH.                               | Date of Picking..... | MUST.                          |                        |                       |           | WINE.           |                |             |                         |                             |                     |
|----------------|---------------------------------------------|----------------------|--------------------------------|------------------------|-----------------------|-----------|-----------------|----------------|-------------|-------------------------|-----------------------------|---------------------|
|                |                                             |                      | Solid Contents by Spindle..... | Sugar by Copper Test.. | Acid as Tartaric..... | Ash ..... | Alcohol.        |                | Tannin..... | Total Acid as Tartaric. |                             | Volatile Acid ..... |
|                |                                             |                      |                                |                        |                       |           | By Weight ..... | By Volume..... |             | At Pressing .....       | At Six to Eight Months..... |                     |
| 1883—No. 147.  | J. H. Drummond, Glen Ellen§                 | Sept. 10             | 21.60                          | 21.80                  | .66                   | .33       | 8.48            | 10.58          | *.090       | .43                     | .43                         | Ash .....           |
| 1884—No. 232.  | Natoma Company, Natoma.....                 | Sept. 27             |                                |                        |                       |           | 10.07           | 12.54          | *.090       | .45                     | .40                         | Body .....          |
| 1884—No. 233.  | Natoma Company, Natoma.....                 | Sept. 27             |                                |                        |                       |           | 10.81           | 13.27          | *.110       | .38                     | .39                         |                     |
| 1886—No. 498.  | J. T. Doyle, Cupertino.....                 | Sept. 25             | 22.00                          | 21.80                  | .76                   | .37       | †8.84           | †11.00         | *.110       | .65                     |                             |                     |
| 1886—No. 498.  | J. T. Doyle, Cupertino.....                 | Sept. 25             | 22.00                          | 21.80                  | .76                   | .37       | †8.62           | †10.80         |             | .69                     |                             |                     |
| 1887—No. 615.  | C. C. McIver, Mission San José*             | Oct. 14              | 24.72                          | 24.12                  | .49                   | .33       | 8.48            | 10.58          | .230        | .75                     |                             |                     |
| 1887—No. 739.  | J. T. Doyle, Cupertino.....                 | Oct. 8               | 24.54                          | 24.12                  | .45                   | .42       | 9.56            | 11.91          | .300        | .61                     | .14                         |                     |
| 1888—No. 890.  | (short-pruned), J. T. Doyle, Cupertino..... | Oct. 8               | 25.39                          | 26.00                  | .35                   | .43       | 9.76            | 12.18          | .308        | .62                     | .45                         |                     |
| 1889—No. 891.  | (long-pruned), J. T. Doyle, Cupertino.....  | Oct. 8               | 25.39                          | 26.00                  | .35                   | .43       |                 |                |             |                         |                             |                     |
| 1889—No. 1119. | John Gallegos, Mission San José**           | Sept. 29             | 25.90                          | 25.53                  | .59                   | .26       |                 |                |             |                         |                             |                     |
| 1890—No. 1236. | John Gallegos, Mission San José             | Oct. 1               | 23.30                          |                        | .84                   | .22       | 9.99            | 12.46          | .259        | .71                     | .43                         |                     |
| 1890—No. 1278. | J. T. Doyle, Cupertino.....                 | Sept. 29             | 24.15                          |                        | .67                   |           |                 |                |             | No wine.                |                             |                     |

\*\* Blended with No. 1116.

\* Young vines.

† June, 1887.

‡ December, 1886.

§ Wines sent for examination.

[illegible]

...and the other two are equal to zero.

## COLOR READINGS.

| PETITE SIRAH.            | 1886.                                      |                                       | 1887.                     | 1888.        |
|--------------------------|--------------------------------------------|---------------------------------------|---------------------------|--------------|
|                          | J. T. Doyle,<br>Expt'l Plot,<br>Cupertino. | C. C. McIver,<br>Mission San<br>José. | John T. Doyle, Cupertino. |              |
|                          | No. 498.                                   | No. 615.                              | No. 739.                  | No. 890.     |
| At pressing { Date ----- | Oct. 6.                                    | Oct. —.                               | Oct. 26.                  | Oct. 12.     |
| { Color -----            | 46.5 1 V. R.                               | 83.3 1-2 V. R.                        | 100.0 V. R.               | 86.9 1 V. R. |
| One month -----          | 36.4 1 V. R.                               | 83.3 1-2 V. R.                        | -----                     | 66.6 1 V. R. |
| Two months -----         | 32.3 2 V. R.                               | 77.0 1 V. R.                          | 44.4 V. R.                | 54.8 1 V. R. |
| Three months -----       | -----                                      | -----                                 | -----                     | 48.8 2 V. R. |
| Four months -----        | 27.6 3 V. R.                               | 61.5 2 V. R.                          | 23.0 1 R.                 | 41.2 3 V. R. |
| Five months -----        | -----                                      | -----                                 | -----                     | 38.8 3 V. R. |
| Six months -----         | 27.6 1 V. R.                               | -----                                 | -----                     | -----        |
| Seven months -----       | -----                                      | -----                                 | 24.3 5 V. R.              | 38.0 4 V. R. |
| Eight months -----       | 26.2 2 V. R.                               | -----                                 | -----                     | -----        |

## COLOR READINGS.

| SÉRINE.                 | 1887.                                      |              | 1888.                        |                | 1889.                                |  |
|-------------------------|--------------------------------------------|--------------|------------------------------|----------------|--------------------------------------|--|
|                         | J. T. Doyle, Experimental Plot, Cupertino. |              | Margherita Vineyard, Fresno. |                | J. T. Doyle, Expt'l Plot, Cupertino. |  |
|                         | No. 767.                                   |              | No. 920.                     |                | No. 1147.                            |  |
| At pressing { Date..... | October 29.                                | October 24.  | September 11.                | October 15.    | October 8.                           |  |
| Color.....              | 95.2 V. R.                                 | 60.0 1 V. R. | 70.0 V. R.                   | 78.4 1 V. R.   | 78.4 1 V. R.                         |  |
| One month.....          | 96.2 V. R.                                 | 54.8 1 V. R. | 19.0 1-2 R.                  | 53.3 1-2 V. R. | 57.1 2 V. R.                         |  |
| Two months.....         | 95.2 V. R.                                 | 44.9 1 V. R. | 19.0 1 R.                    | 45.9 1 V. R.   | 32.0 1 V. R.                         |  |
| Three months.....       | 88.8 1 V. R.                               | 43.5 1 V. R. | 21.0 1 R.                    | 41.6 1 V. R.   | 32.0 1 V. R.                         |  |
| Four months.....        | 88.8 1 V. R.                               | 43.5 1 V. R. | 20.5 1 R.                    | 42.5 1 V. R.   | 32.0 1 V. R.                         |  |
| Five months.....        | 80.0 1 V. R.                               | 36.3 3 V. R. | 20.3 2 R.                    | 35.7 1 V. R.   | 31.5 1 V. R.                         |  |
| Six months.....         |                                            |              | 18.2 4 V. R.+1 Y.            |                |                                      |  |
| Seven months.....       |                                            |              |                              |                |                                      |  |
| Eight months.....       |                                            |              |                              |                |                                      |  |

\* Blend of four fifths Sérine and one fifth Petite Sirah.



*No. 739: Sirah.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 15, 1887, and were crushed October 17th. Their condition was good, but overripe; stems green as yet, but somewhat wilted. Coulure very severe; 40 to 50 per cent, mostly in bloom, but some showing in small berries, buckshot size, as in the Cuisant, No. 702; hence the test of wine will not be quite fair. Berries very sweet, but still somewhat acid; enough for good fermentation. The juice showed 24.72 per cent of solid contents. Fermentation of 56 pounds crushed began on October 18th, and reached its maximum of 84.5° on the 20th. Murk was drawn off on the 25th, nine days from crushing. The yield from the above amount was 3½ gallons, or at the rate of 34 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. December 16. Wine slightly acetified.

December 19. Racked and pasteurized the wine.

1888. February 8. A bright wine, somewhat acetified, but acid not offensive, although it covers the astringency.

May 5. Bouquet well developed, though still slightly acetous; the acid sharp to taste; high body and astringency. A characteristic wine if it were sound.

May 28. Racked again.

1889. November. (In bottles.) Aside from a suspicion of lactic taint, the wine is of good quality, but will not stand dilution.

*No. 890 (short-pruned). Petite Sirah.* From J. T. Doyle, Cupertino. The grapes arrived in good condition and were worked October 9, 1888. Bunches greatly affected by both early and late coulure; stems green; berries medium size and with little bloom. Juice showed 24.54 per cent of solid contents.

*No. 891 (long-pruned).* Condition good; late coulure much more than in the case of short pruning; little early coulure; berries much sweeter than the former; a few bunches show sunburn. Juice showed 25.39 per cent of solid contents. These lots (166.5 pounds) were fermented together. Fermentation began October 9th, reached its maximum of 95° on the 11th, and was pressed on the 12th, three days from crushing. The yield from the above amount was 14½ gallons, or at the rate of 171.7 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. November 15. Taken to cellar.

December 17. Wine racked; a good, clear, clean-tasted wine of undeveloped bouquet, with medium acid and high tannin. Lees show a very small amount of lactic ferment.

1889. January 12. (No. 890 Sirah, No. 920 Sérine.) "Both good wines, much alike; Sirah the finer of the two in this case." (E. W. H. and F. P.)

March 26. Pasteurized.

May 20. Racked again; condition clear.

August 6. Condition bright, with a good dark red color, very good bouquet, agreeable flavor, well-developed vinous taste, medium acid, full astringency and alcohol, high quality, and stands a large amount of dilution.

November 4. Sample in keg same as at last tasting.

1890. February 8. Lees show no unsound germs.

February 18. A good, bright, well-developed wine of full vinosity and marked and characteristic bouquet.

March 3. Racked.

July 17. Lees show no unsound germs.

July 23. Bright, good color, with a rich and pleasing bouquet and flavor; but there is a suspicious lactic taint; otherwise good.

August 12. Bottled.

1891. February 17. Wine bottled March 3, 1890, bright, a considerable but well-settled deposit; good, but not high bouquet, full clean taste and good quality. Wine bottled August 12th, deteriorated, much inferior to the foregoing bottled five months earlier.

*No. 1119. Petite Sirah.* From J. Gallegos, Mission San José. The grapes arrived October 1, 1889, in good condition, but somewhat past maturity, many grapes being half dried; they were crushed on the day of arrival and were fermented with No. 1116, Sérine, Mission San José.

**No. 767. Sérine.** (Grafts of 1886.) From J. T. Doyle, Cupertino Experimental Plot. The grapes arrived October 21, 1887, and were crushed the following day. Their condition was only fair. Berries overripe and mostly flabby, some half dried. Bunches mostly small, with a great deal (30 to 40 per cent) of coulure; early, hence loose. Berries very sweet, yet with some astringency and acid; rather below the average size of the Sirah sample and not as satisfactory; will hardly do for a fair comparison. The juice showed 29.19 per cent of solid contents. Fermentation of 34.25 pounds crushed began on October 23d, and reached its maximum of 79° on the evening of same day. On the 29th the murk was drawn off, seven days from crushing, fermentation at no time having been violent. The yield from the above amount was  $2\frac{3}{4}$  gallons, or at the rate of 139 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 16.** Wine heavy-bodied and clean-tasted, apparently slightly sweet. Test for sugar shows the presence of a small amount.

1888. January 25. Racked.

February 16. A bright, very heavy-bodied, deep-tinted wine, with perhaps a trace of sugar; a bitterish taste, not strikingly developed bouquet and rather backward vinosity, as the sample is in glass.

May 31. Racked again.

June 19. Condition bright, with peculiar bouquet, somewhat bitter taste, heavy body, moderate acid. Probably the wine cannot develop, being in glass. The sediment shows only a trace of lactic germs under the microscope.

**No. 920. Sérine.** From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived and were worked October 19, 1888; condition good; bunches small, considerably affected by coulure; berries ripe and very small; stems green. The juice showed 25.74 per cent of solid contents. Fermentation of 106.5 pounds crushed began on October 28th, and reached its maximum of 89.5° two days later. On October 24th the murk was drawn off, five days from crushing. The yield from the above amount was 8 gallons, corresponding to 150.2 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. December 3.** Taken to cellar.

1889. January 9. Racked; a good, clear wine, of very well-developed bouquet and well-proportioned acid and tannin; after-taste gives a very slight impression of lactic taint.

February 23. A microscopical examination of the sediment shows lactic germs. Pasteurized the wine.

May 16. Racked again; condition clear.

August 19. A bright, violet-red colored, and good wine, with an agreeable but slightly foreign flavor.

1890. February 10. Lees show some acetic germs; a bright, well-matured wine, of agreeable bouquet and flavor; acetic acid not perceptible to taste.

March 10. Racked into glass; a slight acetic odor perceptible during the racking.

July 20. As the wine was evidently deteriorating, it was discarded.

**No. 1042. Sérine.** From Margherita Vineyard, Fresno. The grapes arrived very much overripe, and half dried up, otherwise in fair condition. They corresponded to Pulliat's description, though the bunches were rather small. The grapes were worked September 6, 1889, the day after their arrival. The juice showed 29.75 per cent of solid contents. Fermentation commenced September 8th, and reached its maximum of 90° on the following day. The murk was drawn off on September 11th, five days after crushing. From the 75 pounds crushed, 5.56 gallons were obtained, corresponding to 148.33 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1889. October 14.** Condition clear, with high astingency and dark-red color.

November 2. Racked and taken to the cellar.

1890. January 27. Wine of agreeable bouquet and flavor; of good taste and high quality. Lees show lactic germs.

*May 1.* Racked. A clear wine, with a very slightly suspicious taste. Lees show some long filaments of lactic germs.

*May 29.* Wine clear; lactic taint perceptible to the taste. Pasteurized.

*June 12.* Wine of fair quality but for lactic taint.

*July 8.* Racked.

*August 4 and December 14.* Examination showed increase of lactic taint.

*1891. January 27.* Wine evidently deteriorating, was discarded.

*No. 1116. Blend of  $\frac{4}{5}$  Sérine and  $\frac{1}{5}$  Petite Sirah.*—From J. Gallegos, Mission San José. The grapes arrived October 1, 1889, and were crushed the same day. Many bunches were overripe, but otherwise the condition was good. Bunches below medium size; flesh firm, and of sweet and agreeable flavor. The juice showed 26.30 per cent of solid contents. This lot was fermented with Petite Sirah, No. 1119, in a closed vat, surrounded by water kept at the mean temperature of 63.5°. Fermentation started October 2d, and reached its maximum of 87° on the 5th. The murk was drawn off October 7th, six days from crushing. From 137 pounds crushed, 11.62 gallons were obtained, or 169.7 gallons per ton.

*RECORD OF TREATMENT AND TASTING.*—1889. *November 25.* Condition bright, with deep color, faint bouquet, agreeable flavor and a little flattish taste, full body, medium acid, and high astringency; quality good, but rough.

*November 27.* Racked and taken to the cellar.

*1890. January 20.* Condition bright, with improved bouquet and good taste, but the wine is still rough. Lees sound.

*May 2.* A bright and sound wine. Racked.

*May 19.* Lees show a few lactic germs. Bouquet and flavor full and agreeable; adequate acid and astringency; good body and high quality.

*July 31.* Lees show a few filaments.

*August 14.* In good condition, but not much improved since last tasting.

*August 30.* Racked.

*1891. January 1.* Lees show no unsound germs.

*January 2.* Wine developing well, full-bodied and of high quality.

*March 16.* Racked, and some wine bottled. The wine bottled August 30, 1890, bright and sound, but not equal to that in keg. A considerable deposit on sides of bottles.

*No. 1147. Sérine.* From J. T. Doyle, Cupertino. The grapes arrived October 9, 1889, in good condition, though a little past maturity, and were crushed the same day. The grapes were picked the day after a heavy rain. The solid content was 25.90 per cent. Fermentation started October 10th, and continued gently, reaching its maximum of 86.5° on October 12th. The murk was drawn off on October 14th, four and one half days from crushing, being still a little sweet. From 97.5 pounds crushed, 7.75 gallons were obtained, corresponding to 159 gallons per ton.

*RECORD OF TREATMENT AND TASTING.*—1889. *December 3.* Condition bright, with a dark color, good bouquet, an agreeable flavor, taste a little bitter, full body and alcohol, medium acid, high astringency, and good quality.

*December 4.* Racked and taken to cellar.

*1890. January 23.* A bright wine, with a slight foreign after-taste. The sediment shows a very few lactic germs.

*March 18.* Pasteurized at 152°.

*June 12.* Bright and sound, the suspicious after-taste has gone.

*July 8.* Racked, in good condition.

*August 5.* Lees show a few dead lactic germs.

*1891. January 21.* Bright, full-bodied, and of good flavor; not a high bouquet; mature.

*February 17.* Wine bottled March 18, 1890, is spoiled. Wine in keg was bottled.

### *Discussion of Results.*

From the above records it appears that the varieties grown here under the names of Sirah and Sérine have shown some differences even in the crop, as stated at first. At the Cupertino Experimental Plot, except in the case of the young vines in 1887, when the crop of the Sirah was

larger than that of the *Sérine*, the latter gave a higher yield than the former in the seasons of 1888 and 1889. In the latter year it bore twice as much as the *Sirah*. The largest crop in both varieties was obtained from the half-long-pruned vines; but we should remember that the *Sirah* was much injured by coulure in 1889, while the *Sérine* had no traces of it. Hence it is evident that the selection of the wood must be taken into consideration in the propagation of this variety, and that the *Sérine* type is a safer bearer.

The saccharine strength varied in the *Sirah* from 22 to 26 per cent, the larger amount in favor of the long-pruned vines; in the *Sérine* the proportion was from 26 to 29.21 per cent.

Such great variation in the amount of sugar in the grapes has produced, naturally, a great variation in the amount of alcohol in the wine, the maximum of which was 12.54 per cent (*Sirah*) and 14.50 per cent (*Sérine*). But we may say that under ordinary conditions this variety easily makes a wine of fully 12 per cent of alcohol by volume.

As to tannin, there is a little difference in favor of the *Sirah*; while the contrary occurs as regards the body, which was a little higher in the *Sérine*; but, on the whole, they both constitute a highly-astringent and heavy-bodied wine.

The acidity in general was medium in both, except in the cases of young vines (in which a lower proportion of sugar and a higher one of acids is always expected); as also in the case of the grapes from Fresno and Cupertino of the seasons 1887 and 1889, which had a low acidity, together with the high proportion of sugar above mentioned. There is a little difference in favor of the *Sirah*, but in general (excepting again the case of wines made from grapes of the earlier crops), the proportion of acid was not adequate; and it is likely that the poor keeping qualities of the wine resulted principally from the deficiency of its acidity.

The color was a little higher in the *Sirah*, but rather persistent in both; the less-colored wine was obtained from the Fresno grapes.

Both wines are quite alike in general character; the *Sirah* seems in some cases a little finer than the *Sérine*.

Doubtless all the above-mentioned defects can be easily avoided or corrected by a careful selection of the wood in propagating this variety, and by a proper blend, as already stated. The marked liability of the *Sirah* type to coulure, which has also been noted in the Livermore and Napa Valleys, has discouraged the propagation of the variety thus far; but it seems from our record, that this difficulty might be measurably overcome by the selection of the *Sérine* type.

#### MONDEUSE.

The *Mondeuse* is cultivated chiefly in southeastern France, in the more northern departments bordering on the Rhône, and in Savoy, where it forms a large proportion of the vineyards, and yields excellent red wines, provided it is planted on upland slopes with good exposure, as it needs considerable heat to acquire its best qualities; in valley lands, or on unfavorable slopes, it rapidly loses quality. The wine is heavy-bodied and deeply colored, but less than that of the *Sirah*; it is also somewhat rough at first and rather slow to mature, but seems to be a better keeper than the latter variety, and on the whole of somewhat lower quality.

The Mondeuse is a heavy bearer, and prefers rich soils in which lime and clay prevail; it prefers long pruning. It does well blended with the Sirah. Its bunches are large, and in California very long, pyramidal, shouldered, but not compact; the peduncle is rather long and strong; the berries medium size, ellipsoidal; skin resistant, purplish-black, and pruinose at the time of maturity, which occurs at the second period; pedicels long, but not strong.

In California the Mondeuse has proved a remarkably strong grower, hardy against frost, sunburn, and mildew, and an early and regular bearer. The excessively long growth of its shoots suggests the need of summer pruning (topping), especially in windy localities, where the canes are liable to be injured by "whipping," and by offering too great a purchase to the wind, so that the stake is heeled over and the grapes exposed to the sun. Otherwise, it protects them well and matures its crop regularly.

TABLE OF PRODUCTION.

| MONDEUSE.                                                                        | Number of Vines.. | Total Weight of Grapes, in lbs.... | Average per Vine, in lbs..... | Date of Picking... |
|----------------------------------------------------------------------------------|-------------------|------------------------------------|-------------------------------|--------------------|
| 1887—No. 758 (long-pruned). J. T. Doyle, Experimental Plot, Cupertino.....       | 20                | 235                                | 11.7                          | Oct. 25            |
| 1888—No. 913 (short-pruned). J. T. Doyle, Experimental Plot, Cupertino.....      | 17                | 285                                | 16.7                          | Oct. 10            |
| 1889—No. 1151 (half-long-pruned). J. T. Doyle, Experimental Plot, Cupertino..... | 18                | 180                                | 10.0                          | Oct. 8             |

## ANALYSES OF WINES.

## MONDEUSE.

|                                                    | Date of Picking | MUST.                     |                      |                  |     | WINE.    |        |                         |               |      |     |
|----------------------------------------------------|-----------------|---------------------------|----------------------|------------------|-----|----------|--------|-------------------------|---------------|------|-----|
|                                                    |                 | Solid Contents by Spindle | Sugar by Copper Test | Acid as Tartaric | Ash | Alcohol. | Tannin | Total Acid as Tartaric. | Volatile Acid | Body | Ash |
| 1884—No. 235. Natoma Company, Natoma               | Sept. 7         | 20.16                     | 20.39                | .51              | .22 | 9.56     | .170   | .41                     |               | .264 | .24 |
| No. 236. Natoma Company, Natoma                    | Sept. 28        | 22.60                     |                      |                  |     | 9.92     | .140   | .53                     |               | .284 | .36 |
| 1886—No. 479. J. Gallegos, Mission San José        | Sept. 18        | 17.90                     | 17.99                | .63              | .28 | 7.64     | .130   | .78                     |               | 2.00 |     |
| No. 532. William Pfeffer, Guberville               | Oct. 13         | 20.70                     | 19.50                | .70              | .31 | 7.99     | .320   | .64                     |               | 2.22 |     |
| No. 568. E. W. Hilgard, Mission San José           | Nov. 15         | 25.00                     |                      | .87              |     | 7.57     |        | No wine                 |               |      |     |
| No. 618. C. C. McIver, Mission San José*           | Oct. 25         | 22.64                     | 22.23                | .54              | .42 | 9.70     | .280   | .68                     |               | 3.00 | .27 |
| 1887—No. 788 (long-pruned), J. T. Doyle, Cupertino | Oct. 5          | 22.94                     | 23.32                | .35              | .35 | 8.98     | .330   | .55                     |               | 2.60 |     |
| 1888—No. 888. E. W. Hilgard, Mission San José      | Oct. 10         | 20.24                     | 20.99                | .47              | .30 | 9.20     | .329   | .57                     |               | 2.20 |     |
| No. 913. J. T. Doyle, Cupertino                    | Oct. 1          | 22.40                     | 22.23                | .50              | .43 | 7.23     | .294   | .81                     |               | 2.60 |     |
| 1889—No. 1142. J. Gallegos, Mission San José       | Oct. 8          | 22.80                     | 23.13                | .36              | .33 | 9.05     | .286   | .44                     |               | 2.87 |     |
| No. 1151. J. T. Doyle, Cupertino                   | Oct. 7          | 20.40                     |                      | .79              | .21 | 9.20     | .349   | .30                     |               | 3.05 |     |
| 1890—No. 1312. J. T. Doyle, Cupertino              | Oct. 11         | 21.70                     |                      | .76              | .21 | 7.78     | .237   | .45                     |               | 2.70 |     |
| No. 1334. J. Gallegos, Mission San José            |                 |                           |                      |                  |     | 8.84     | .294   | .58                     |               | 2.58 |     |

\* Wine sent for examination. † December, 1886. ‡ June, 1887.

## COLOR READINGS.

| MONDEUSE.     | 1896.                                 |                              |                                       | 1897.                                      | 1898.                                  | 1899.                                      |                |                |
|---------------|---------------------------------------|------------------------------|---------------------------------------|--------------------------------------------|----------------------------------------|--------------------------------------------|----------------|----------------|
|               | F. Pohndorff,<br>Mission San<br>José. | Wm. Pfeiffer,<br>Guberville. | C. C. McIver,<br>Mission San<br>José. | J. T. Doyle,<br>Expt'l Plot,<br>Cupertino. | E. W. Hilgard,<br>Mission San<br>José. | J. T. Doyle,<br>Expt'l Plot,<br>Cupertino. |                |                |
|               | No. 479.                              | No. 532.                     | No. 618.*                             | No. 758<br>(long-pruned).                  | No. 888.                               | No. 913.                                   |                |                |
|               | No. 1142.                             | No. 1151.                    | No. 1142.                             | No. 1151.                                  | No. 1142.                              | No. 1151.                                  |                |                |
| Must.         | Sept. 28.                             | Oct. 23.                     | Sept. —.                              | Oct. 27.                                   | Oct. 12.                               | Oct. 16.                                   | Oct. 8.        | Oct. 15.       |
| At pressing { | 31.7 2 V. R.                          | 39.2 3 V. R.                 | —                                     | 61.0 1 V. R.                               | 54.8 2 V. R.                           | 58.8 2 V. R.                               | 71.4 1+V. R.   | 57.1 1+V. R.   |
| Color {       | 27.3 2 V. R.                          | 36.6 2 V. R.                 | —                                     | 26.2 2 V. R.                               | 45.9 1 V. R.                           | 44.4 2 V. R.                               | 44.4 1-2 V. R. | 50.0 1-2 V. R. |
| One month     | —                                     | 33.3 2 V. R.                 | —                                     | —                                          | 40.4 1 V. R.                           | 40.0 3 V. R.                               | 17.4 2 V. R.   | 23.2 1 V. R.   |
| Two months    | —                                     | —                            | —                                     | —                                          | 41.1 1 V. R.                           | 36.7 2 V. R.                               | 17.0 3 V. R.   | 30.7 1 V. R.   |
| Three months  | —                                     | —                            | —                                     | 27.6 3 V. R.                               | 38.0 1 V. R.                           | 36.3 2 V. R.                               | 17.0 3 V. R.   | 30.7 1 V. R.   |
| Four months   | —                                     | —                            | 80.0 2 V. R.                          | —                                          | 40.0 1 V. R.                           | —                                          | 17.4 2-3 V. R. | 23.0 1 V. R.   |
| Five months   | —                                     | 24.4 2 V. R.                 | —                                     | —                                          | —                                      | —                                          | —              | —              |
| Six months    | —                                     | 22.9 2 V. R.                 | —                                     | 23.5 2 V. R.                               | 25.8 4 V. R.                           | 19.5 4 V. R.                               | —              | —              |
| Seven months  | —                                     | —                            | —                                     | —                                          | —                                      | —                                          | —              | —              |
| Eight months  | —                                     | —                            | —                                     | —                                          | —                                      | —                                          | —              | —              |

\* Wine sent for examination.

*No. 758 (long-pruned). Mondeuse.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 21, 1887, and were crushed the following day. Their condition was good, but a little overripe, stems rather dry, and many berries a little flabby; bunches only moderately large, with some coulure, as much as 25 to 30 per cent in some boxes. Berries rather large and very sweet, yet acid. Long-tailed, characteristic bunches abundant among the small-sized, coulured ones. Juice showed 22.64 per cent of solid contents. Fermentation of 93 pounds crushed reached its maximum of 83° on October 25th. The murk was drawn off on October 27th, five days from crushing. The yield from the above amount was  $7\frac{3}{8}$  gallons, or at the rate of 158.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 6.* Racked the young wine off the lees.

*December 20.* Condition bright, markedly developed bouquet, marked and well-proportioned acid and astringency, and only medium body.

*1888. February 9.* A bright, sound, heavy-bodied wine of high astringency.

*June 20.* Condition bright, with a ruby color, distinct bouquet, but not advanced since last tasting; low acid, high astringency, and a strong raspberry flavor. The sediment shows lactic germs in very small amount; racked and pasteurized the wine for safety.

*No. 888. Mondeuse.* From E. W. Hilgard, Mission San José. Grapes arrived October 8, 1888, in good condition, and were worked the same day; no coulure, but a little sunburn, and grapes burnt from the rain-drops on the berries. Stems green, but berries fully ripe. Juice showed 22.94 per cent of solid contents. Fermentation of 139.5 pounds crushed began on October 9th, and reached its maximum temperature of 90° two days later. The murk was drawn off on October 12th, three days from crushing. The yield from the above amount was 10 $\frac{1}{2}$  gallons, corresponding to 155.8 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *October 30.* Racked. Wine sound.

*November 28.* Taken to the cellar.

*1889. March 20.* Racked again; lees sound.

*August 20.* Condition bright; dark-red color; bouquet and flavor not marked; flat taste; medium body and alcohol; full acid and astringency; fair quality, and stands dilution well.

*1890. February 8.* Lees show a considerable amount of bitter ferment.

*February 16.* Wine is clear, but has not improved since last tasting.

*February 18.* Racked.

*July 17.* Lees show no more unsound germs.

*July 20.* Bright, well colored, smooth, and agreeable, but without much bouquet or character; mature.

*August 13.* Bottled.

*1891. February 16.* Wine bottled March 20, 1889, is thick and spoiled. Wine bottled March 10, 1890, not clear, and is spoiled. Wine bottled August 13, 1890, bright; a little bouquet, and rather pleasing flavor; general quality fair.

*No. 913. Mondeuse.* From J. T. Doyle, Cupertino. Grapes arrived on October 12, 1888, in good condition, and were worked the same day. Berries full ripe; bloom heavy; very little affected by coulure and sunburn; stems partly dried. Juice showed 20.24 per cent of solid contents. Fermentation of 142 pounds crushed began October 13th, and reached its maximum of 92° the next day. On October 16th the murk was drawn off, four days from crushing. Yield from the above amount was 12 gallons, corresponding to 168.4 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 2.* Taken to the cellar.

*1889. January 9.* A clear, sound, and well-colored wine, of good bouquet and high quality; as compared with the same wine from Natoma and Mission San José, it seems to be lacking in tannin.

*January 12.* Nos. 888, 913. "Both good; more color from the Mission; will make a good blend with one half Burger." (E. W. H. and F. P.)



*March 19.* Lees shows lactic germ; pasteurized.  
*May 20.* Racked again; wine clean.  
*August 20.* A rather good wine; as yet of little bouquet and flavor.  
*1890. February 25.* Lees sound; wine improved as to the bouquet and flavor, but not mature enough to bottle.  
*February 27.* Racked partly into glass.  
*July 17.* Lees show no abnormal germs.  
*July 23.* Clear, fairly good, but deteriorated since last tasting.  
*August 13.* Bottled.  
*1891. February 26.* Wine bottled February 27, 1890, bright, good bouquet, little deposit, quality good. Wine bottled August 13, 1890, much inferior.

*No. 1142. Mondeuse.* From J. Gallegos, Experimental Plot, Mission San José. The grapes arrived in good condition, except as to overripeness, on October 4, 1889, and were crushed the same day. The juice showed 22.40 per cent of solid contents. Fermentation of 110.5 pounds crushed, started October 5th, and reached its maximum of 91.5° on the 6th. The fermentation was brisk and the murk was drawn off on October 7th. The yield from the above amount was about 11 gallons.

RECORD OF TREATMENT AND TASTING.—1889. *December 3.* Racked and taken to cellar. A bright, clean wine of good vinous flavor.

*1890. January 22.* Wine developing well; a claret-like bouquet and flavor; lees still sound.

*April 27.* Racked.

*May 19, June 3, July 31.* Lees sound.

*1891. January 1.* Lees sound.

*January 2.* Bright, fine, well-marked bouquet and full flavor, well matured, and of high quality.

*March 17.* Wine bottled April 27, 1890, clear and sound but raw, inferior to that kept in keg.

*August 26.* Wine in keg bottled.

*No. 1151. Mondeuse.* From J. T. Doyle, Cupertino. Many of the bunches had suffered rather badly from coulure. They were picked the day after a heavy rain, but arrived in fair condition, though a little past maturity. The juice showed 22.80 per cent of solid contents. They were crushed October 10, 1889, the day after arrival. Fermentation of 89 pounds crushed started October 11th, reaching its maximum of 89° on the 12th and continuing slowly until October 14th, when the murk was drawn off, being quite dry; 7.2 gallons were obtained, corresponding to 160 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *December 4.* Racked and taken to cellar; condition bright, with dark color, undeveloped bouquet, agreeable flavor, smooth and clean taste, and adequate acid, astringency, alcohol, and body; general quality good.

*1890. January 23.* A bright, clean, and pleasant wine. Lees show very small amount of lactic germs.

*May 7.* Pasteurized the wine.

*January 12.* Full flavored and clean tasting.

*August 4.* Lees show a few dead lactic germs.

*September 4.* Bright, maturing slowly, but good and sound. Racked.

*December 31.* Lees show some new lactic germs.

*1891. January 2.* Bright, a suspicion of lactic taint, otherwise as good as before.

*February 17.* Wine bottled September 4, 1890, bright, good, and sound. Wine in keg bottled.

### *Discussion of Results.*

As regards production, the Mondeuse is a very good, early, and regular bearer, especially when pruned long. At the Cupertino Experimental Plot the crops for the years 1887, 1888, and 1889 were, respectively at the rate of about 3.936, 5.594, and 3.350 tons per acre, the first two yields being for the long-pruned vines and the last for the half-long-pruned ones. Similar results have been obtained at Mission San José.

Considering only the products of the above-mentioned years, we observe that the saccharine strength of the must varied from 20.99 to

23.13 per cent at Cupertino, and from 22.23 to 23.32 per cent at Mission San José; and the proportion of acidity was sometimes low and sometimes medium, with relation to the percentage of sugar.

This variety makes a wine of about 12 per cent of alcohol by volume, and is well colored, highly astringent, with light or medium acidity and heavy body. The general quality of the wine may be considered as good, but it matures slowly; it, however, is a good keeper, and when old acquires a fine marked bouquet and flavor and a delicate taste that place it among the best wines of its type.

The record of No. 888 shows well the slow maturity of the wine and the danger of too early bottling. Altogether this variety may safely be considered one of those destined for permanent use in the higher class of clarets, not by itself, but in suitable blends.

The Mondeuse, that is also known by the name of Grosse Sirah in the vineyards, nearly that of the "Hermitage," should accompany the Sirah, and in the proportion of about one fifth, in blending with dry and hardy wines like those of the Mataro, Malbeck, the Cabernets, and even with the Aramon, but it should never be blended with wines that are too smooth, such as those of the Carignane and Grenache.

#### MATARO.

(*Synonyms:* Espar, Mourvèdre, Balzac, etc. Upright "Burgundy" of California.)

This variety is of Spanish origin, but actually is the one mostly cultivated in southern France; it has also been cultivated in Algeria, to which climate it has shown itself well adapted.

In California, also, it has given good results, and should be propagated more than has been done so far.

The Mataro by itself gives in France a heavy-bodied, well-colored wine of good keeping qualities. It may be blended with the Grenache, the Carignane, and the Aramon, but at least in the proportion of one half or two thirds, whenever we desire choice wines.

The Mataro is a good bearer, and stands heat well. Frost, mildew, and coulure have also but little effect upon it, but it is liable to injury from early rains, being thin-ribbed. It prefers short pruning and matures late. Sandy and calcareous soils with a permeable subsoil, as well as the heavy soils, are suitable to it; it produces less, however, in argillaceous soils. It grows as well on the hills as in the flat lands; in the latter it may be pruned half-long.

The Mataro should be classed after the Pinots, the Cabernets, and the Malbeck—its product is far ahead of that of the Mourastel. It produces later than other varieties, and partly for this reason it has not been largely propagated in California, and its best qualities have, perhaps, not been developed in the coast valleys, where alone it has been grown thus far.

Its leaves are rather large, five-lobed, dark green in color above, cottony on the lower surface, giving them a whitish aspect; puckered on the upper surface, petiole and veins of a dark red color. After the growing season the leaves become somewhat reddish on their margin. Bunches medium size, conical, with small shoulders. Berries black, larger than those of the Mourastel, with a soft and juicy flesh, sweet but somewhat green to the taste, and not very agreeable to eat; skin thin, and not much colored.



## COLOR READINGS.

| MATABO.           | 1886.                    |                            |                            | 1887.                           |                                    |                                             | 1888.                                             |                           | 1889. |
|-------------------|--------------------------|----------------------------|----------------------------|---------------------------------|------------------------------------|---------------------------------------------|---------------------------------------------------|---------------------------|-------|
|                   | D. C. Feely,<br>Patches. | J. T. Doyle,<br>Cupertino. | J. T. Doyle,<br>Cupertino. | J. Bergin,<br>Mountain<br>View. | Margherita<br>Vineyard,<br>Fresno. | A. Caminetti,<br>Jackson. Amador<br>County. | J. Gallegos,<br>Expt'l Plot,<br>Mission San José. | A. Caminetti,<br>Jackson. |       |
|                   | No. 586.                 | No. 597.*                  | No. 782.                   | No. 735.                        | No. 760.                           | No. 853.                                    | No. 921.                                          | No. 1069.                 |       |
| Must.-----        | Rose.                    | November.                  | November 2.                | October 22.                     | October 27.                        | September 24.                               | October 24.                                       | September 24.             |       |
| At pressing {     | December 9.              | December.                  | 36.3 1 V. R.               | 32.0 2 V. R.                    | 9.0 2 R.                           | 17.4 4 V. R.                                | 20.0 2 V. R.                                      | 27.2 R.                   |       |
| Color {           | 44.0 2 V. R.             | 27.2 2 V. R.               | 23.9 1-2 V. R.             | 16.0 2 V. R.                    | 8.3 2 R.                           | 13.3 R.                                     | 14.0 4-5 V. R.                                    | 15.2 3-4 R.               |       |
| One month-----    |                          |                            | 21.9 4 V. R.               | 17.3 2 V. R.                    | 5.0 3 R.                           | 14.0 R.                                     | 8.0 1 R.                                          | 17.7 2 V. R.+1 Y.         |       |
| Two months-----   |                          |                            |                            |                                 |                                    | 9.4 4 V. R.+1 Y.                            | 8.0 R.                                            |                           |       |
| Three months----- | 21.5 2 V. R.             |                            |                            |                                 |                                    | 8.9 4 V. R.+1 Y.                            |                                                   |                           |       |
| Four months-----  |                          |                            |                            |                                 |                                    |                                             |                                                   |                           |       |
| Five months-----  | 20.0 2 V. R.             |                            | 9.1 3 R.                   | 13.3 4 V. R.                    | 5.0 3 R.                           |                                             |                                                   |                           |       |
| Six months-----   |                          |                            |                            |                                 |                                    |                                             |                                                   |                           |       |
| Seven months----- |                          |                            |                            |                                 |                                    |                                             |                                                   |                           |       |

\*Wine sent for examination.

**No. 735. Mataro.** From J. Bergin, Mountain View, Santa Clara County. The grapes arrived October 14, 1887, and were crushed the following day. Their condition was good, grapes large and full, just ripe, stems still fresh and stocky, skins very thick, berries full size or a little over; bloom heavy on berries, and very little coulure; quite sweet; a little rough on the palate; bunches large and well packed. Altogether a very good sample. The juice showed 22.84 per cent of solid contents. Fermentation of 48.75 pounds crushed began on the morning of October 16th; reached its maximum of 78° on the following afternoon; remained at that point twenty-four hours. On October 21st the murk was drawn off, six days from crushing. The yield from the above amount was 3½ gallons, or at the rate of 159 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 6.** Racked the wine from the lees.

**December 19.** Condition bright, with a faint bouquet, pronounced but sound acid, low astringency, and medium-heavy body; a clean-tasted wine of quite well-developed vinosity.

**1888. February 9.** Bouquet fairly developed; light acid; only medium body and quite light astringency.

**June 13.** Condition bright, with astringency slightly bitterish; medium acid and well-developed bouquet. The sediment contains effete yeast, amorphous matter, and a small amount of filiform ferment. Racked and pasteurized the wine.

**No. 760. Mataro.** From Margherita Vineyard, Fresno. The grapes arrived October 19, 1887, and were worked on the 21st. Their condition was very poor; berries ripe, flabby, and some of the stems quite dry; a few berries at bottom of baskets moldy, which necessitated picking over; bunches compact, of regular Mataro type, but the berries rather small for the variety. No coulure. The juice showed 24 per cent of solid contents. Fermentation of 111 pounds crushed began on October 22d, and reached its maximum of 84° on the following day, fermentation being very violent until October 25th. It was drawn off on October 27th, six days from crushing. The yield was 8⅞ gallons, or at the rate of 154 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 20.** Wine decidedly acetified.

**December 21.** Racked and pasteurized the sample.

**1888. February 9.** Condition bright; pasteurizing has suppressed the acetous taste, but the wine is still poor.

**June 11.** Acetous odor covers all other qualities of the wine; therefore discarded.

**No. 782. Mataro.** From J. T. Doyle, Cupertino. The grapes arrived October 26, 1887, and were worked the following day. Their condition was good, but somewhat overripe; bunches large and mostly well filled; a few with a good deal of coulure on one side. The juice showed 24.66 per cent of solid contents. Fermentation of 108 pounds crushed began October 28th, and reached its maximum of 83° on the 30th. It was drawn off on November 2d, six days from crushing. The yield from the above amount was 8⅞ gallons, or at the rate of 150 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 20.** Condition clear, with well-advanced bouquet, medium and pleasant acid, heavy body, and medium astringency; a sound and remarkably good wine for Mataro.

**1888. January 25.** Racked the wine.

**February 8.** A bright wine of pleasant acid and astringency, and well-advanced bouquet.

**April 6.** The sediment shows a slight amount of acetic ferments; racked and pasteurized the wine.

**June 17.** Condition bright, with well-developed and alcoholic bouquet and medium acid and astringency.

**1889. November.** A bright, dark-red wine of marked and agreeable bouquet; full acid taste and astringency; good quality.

**No. 853. Mataro.** From A. Caminetti, Jackson, Amador County. Grapes arrived in good condition on September 18, 1888, and were worked the same day. Stems still green, some dried berries, probably unripe. Bunches characteristic, average size; grapes quite sweet. A long way ahead of Santa Clara Valley in time. Juice showed 22.57 per cent of solid contents. Fermentation of 34 pounds crushed began on September 19th, and reached its maximum of 80.5°. On September 24th the murk was drawn off, six days from crushing. Yield from the above amount 2½ gallons, or at the rate of 161.8 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Taken to cellar.

*December 11.* Wine clear and somewhat rough, with undeveloped bouquet and clean taste. Lees show very small amount of lactic ferment; pasteurized.

1889. *February 28.* Racked again; lees show dead lactic ferments.

*August 6.* Condition bright, with light and slightly yellowish color; a very agreeable but not strong bouquet; slightly port-like flavor; a little flat taste and low astringency and acid; high alcohol; quality good; stands a little dilution well.

1890. *February 6.* Lees sound.

*February 15.* A bright, mature-tasting wine, with coarse but not disagreeable flavor.

*March 10.* Racked.

1891. *February 11.* Bright, a little bouquet and full flavor, much improved since bottling; no deposit in bottle.

**No. 921. Mataro.** From J. Gallegos, Mission San José. Grapes received in fair condition on October 20, 1888, and worked the same day. Stems beginning to dry; bunches and berries characteristic. Somewhat affected by both late and early coulure. Many bunches contained some moldy and half-dried grapes. Juice showed 21.10 per cent of solid contents. Fermentation of 93 pounds crushed began on October 21st, and reached its maximum of 90.5° on the following day. On October 24th the murk was drawn off, four days from crushing. The yield from the above amount was 8½ gallons, corresponding to 185.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 2.* Taken to cellar.

*December 17.* Racked the wine. Condition turbid; bouquet undeveloped. Lees sound.

1889. *March 19.* Lees showed some lactic ferment; pasteurized.

*May 28.* Racked again; condition clear.

*August 6.* A poor wine.

1890. *February 10.* Lees sound.

*February 16.* Wine much improved; bouquet and flavor good but not strong.

**No. 1069. Mataro.** From A. Caminetti, Jackson, Amador County. Both bunches and grapes were a little smaller than Pulliat's description of Mourvèdre, otherwise they agreed very well; condition very good; a very few dried grapes on some bunches; maturity complete. The grapes were crushed the day after arrival, September 16, 1889. Juice showed 27.45 per cent of solid contents. Fermentation started on the second day, and continuing slowly, reached its maximum of 85.5° on the fourth day. On the seventh day the mash smelt a little acetous and was pressed; a slight fermentation still continued, but on the eighth day it had stopped, the wine still showing 10.1 per cent of solid contents. It was then fortified to 21.3 per cent of alcohol. From the 119 pounds crushed were obtained 11.5 gallons, corresponding to 195 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *September 26.* Fortified; solid contents 10.1 per cent.

1890. *January 6.* A wine of good port character; bouquet and flavor well developed. *January 13.* Racked and divided into two packages; one of 4½ gallons (No. 1069), and treated three months in hot-box at 120°; the other (No. 1069a), of 5 gallons, treated the same time at 90°.

*May 14.* Removed both from the hot-box and racked again; condition of both turbid and, in general, raw and inferior as ports.

*November 13.* Neither wine clear yet; both somewhat smoother, but still coarse.

1891. *January 22.* Both wines have improved; aromatic and full flavored.

*Discussion of Results.*

In productiveness the Mataro has shown itself to be a very good bearer in all the localities of the State where it has been cultivated, and to be adapted to all kinds of soils, as is the case in France.

The saccharine strength of the grapes has only in one case risen as high as 28.33 per cent (in No. 1069, from Amador); otherwise, it varied from 21 to 23.61 per cent in the samples received from the experimental plots in Cupertino, Fresno, and Mission San José; and on the coast region makes rather light and acid wines.

As to acidity, we note the lowest proportion in Nos. 853 and 1069, both from Amador, and which showed .30 and .36 per cent of acid; in the samples from the above-mentioned localities it varied from .48 to .74 per cent, which, relative to the amount of sugar in the grapes, can be rated as medium to high acidity.

In general it may be said that the Mataro has produced a wine having from 11 to 12 per cent of alcohol by volume, and which has a low astringency and fair acid, and a heavy to medium body.

The wine is a good keeper, and on the whole, of good quality; it is rather coarse when young, and improves by aging.

The samples from Amador that were made into port wines show that the Mataro may be well adapted for this purpose, when grown in such localities, but it requires a long time to develop the qualities of a good port; probably by a proper blend the same object may be obtained in a satisfactory manner in a shorter time. In general it is decidedly more adapted to dry than to sweet wines.

## MOURASTEL.

This variety is often confounded with the Mataro, but they are very distinct and the latter is superior in quality to the former, but not as regards productiveness. The Mourastel is extensively cultivated in the Pyrenées region and in the Hérault, France. It is a vigorous variety and a heavy bearer; resists frosts, oidium, and changes of weather very well. Its wine is highly colored, alcoholic, but often heavy and thick. It develops rather quickly in California, and may give a good wine when blended with the Mataro and the Carignane, or with the Aramon for common wines. It requires short pruning and prefers hillsides and on granitic or clayey soils, where it produces the best quality.

It has strong leaves of a fine green color, a little downy, and slightly sinuate; bunches very large shouldered with close-packed, small, spherical, and very dark berries. At Cupertino it matures on an average about the middle of October, this being one month later than is reported from France.

TABLE OF PRODUCTION.

| MOURASTEL.                    |                           | Number of Vines. | Total Weight of Grapes, in lbs. | Average per Vine, in lbs. | Date of Picking. |
|-------------------------------|---------------------------|------------------|---------------------------------|---------------------------|------------------|
| 1887—No. 757 (long-pruned).   | J. T. Doyle, Cupertino... | 20               | 218                             | 10.9                      | Oct. 19          |
| 1888—No. 945 (long-pruned).   | J. T. Doyle, Cupertino... | 9                | 135                             | 15.0                      | Oct. 25          |
| 1889—No. 1168 (short-pruned). | J. T. Doyle, Cupertino... | 7                | 138                             | 18.6                      | Oct. 14          |

## ANALYSES OF WINES.

| MOURASTEL.                                          | Date of Picking | MUST. |                  |                        |                           | WINE.   |                         |             |        |
|-----------------------------------------------------|-----------------|-------|------------------|------------------------|---------------------------|---------|-------------------------|-------------|--------|
|                                                     |                 | Ash   | Acid as Tartaric | Sugar by Copper Test.. | Solid Contents by Spindle | Alcohol | Total Acid as Tartaric. |             | Tannin |
|                                                     |                 |       |                  |                        |                           |         | At Six to Eight Months  | At Pressing |        |
| 1884—No. 239. Natoma Company, Natoma                | Oct. 1          | .29   | .63              | 18.30                  | 18.79                     | 7.92    | .54                     | .050        | .29    |
| 1887—No. 757 (long-pruned), J. T. Doyle, Cupertino. | Oct. 19         | .39   | .58              | 20.24                  | 21.69                     | 8.48    | .58                     | .140        | 2.60   |
| 1888—No. 945 (long-pruned), J. T. Doyle, Cupertino. | Oct. 25         | .30   | .43              | 27.65                  | 26.88                     | 7.78    | .52                     | .222        | 2.80   |
| 1889—No. 1141. John Gallegos, Mission San José      | Oct. 1          | .44   | .63              | 23.23                  | 23.70                     | 9.20    | .50                     | .147        | 2.85   |
| 1889—No. 1163. J. T. Doyle, Cupertino               | Oct. 14         | .43   | .57              | 23.65                  | 23.90                     | 9.20    | .55                     | .130        | 2.75   |
| 1890—No. 1326. J. T. Doyle, Cupertino.              | Oct. 11         | .31   | 1.37             | —                      | 18.40                     | 7.57    | .81                     | .089        | 2.35   |
| 1890—No. 1350. John Gallegos, Mission San José      | Oct. 12         | —     | .99              | —                      | 21.50                     | 8.62    | .62                     | .191        | 2.32   |
|                                                     |                 |       |                  |                        |                           |         | .52                     |             | 2.75   |



## COLOR READINGS.

| MOURASTEL.              | 1887.                                      |  | 1888.          | 1889.                          |                                            |
|-------------------------|--------------------------------------------|--|----------------|--------------------------------|--------------------------------------------|
|                         | J. T. Doyle, Experimental Plot, Cupertino. |  |                | J. Gallegos, Mission San José. | J. T. Doyle, Experimental Plot, Cupertino. |
|                         | No. 757.                                   |  | No. 945.       | No. 1141.                      | No. 1168.                                  |
| At pressing { Date..... | October 26.                                |  | October 30.    | October 8.                     | October 19.                                |
| { Color.....            | 42.5 1-2 V. R.                             |  | 28.2 2 V. R.   | 55.5 2 V. R.                   | 35.1 1 V. R.                               |
| One month.....          |                                            |  | 19.5 3 V. V.   |                                |                                            |
| Two months.....         | 33.3 1 V. R.                               |  | 17.7 4 V. R.   | 33.3 1 V. R.                   | 33.3 1-2 V. R.                             |
| Three months.....       |                                            |  | 17.7 4 V. R.   |                                |                                            |
| Four months.....        | 12.7 R.                                    |  | 17.7 4-5 V. R. | 24.2 2 V. R.                   | 44.3 4-5 V. R.                             |
| Five months.....        |                                            |  |                | 21.6 3 V. R.                   | 14.3 4-5 V. R.                             |
| Six months.....         |                                            |  |                | 20.5 2 V. R.                   | 14.3 4-5 V. R.                             |
| Seven months.....       |                                            |  |                | 17.2 4 V. R.                   | 11.6 3-4 V. R.                             |
| Eight months.....       | 17.4 4-5 V. R.                             |  | 8.5 1 R.       |                                |                                            |

*No. 757 (long-pruned). Mourastel.* From J. T. Doyle, Cupertino Experimental Plot. The grapes arrived October 19, 1887, and were crushed on the 21st. Their condition was good, and only just ripe; a few unripe, dried berries; but little early coulure, say 8 to 10 per cent. Berries and bunches of good size, the latter very long; branched in many cases, showing distinct lateral bunches from the base of the peduncle. Heavy gray bloom on berries. The juice showed 21.69 per cent of solid contents. Fermentation of 97 pounds crushed began on October 22d, and reached its maximum of 80° on the 24th, fermentation being violent. It was drawn off on October 26th, five days from crushing. The yield from above amount was 7½ gallons, or at the rate of 160 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 20.* Condition clear, with fairly developed and agreeable bouquet; light astringency; medium acid, with a suspicion of acetification. Racked and pasteurized the wine.

1888. *February 8.* Condition bright, with not more pronounced bouquet than on December 20th; sharp acid; low and not pronounced astringency.

*June 19.* Condition bright, with well-developed bouquet; slightly sharp acid; very low astringency; after-taste indicates lactic taint. With the microscope the sediment shows traces of lactic and acetic ferments. Racked again.

*No. 945. Mourastel.* From J. T. Doyle, Cupertino. The grapes arrived and were worked October 26, 1888; condition good, bunches compact and shouldered, almost no coulure; grapes have considerable bloom, full-ripe, acid low, few dried berries, stems green. Juice showed 26.82 per cent of solid contents. Fermentation of 106 pounds crushed began October 27th, and reached its maximum of 92° on the next day. The murk was drawn off on October 30th, four days from crushing. The yield from the above amount was 8½ gallons, or at the rate of 165.1 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Taken to cellar; action quiet.

*December 14.* Racked; a clear, clean wine of undeveloped bouquet, but vinous flavor; acid, tannin, and alcohol medium; lees sound.

1889. *March 14.* Lees show some lactic ferment; pasteurized the wine.

*May 29.* Racked again; condition clear.

*August 2.* A bright, clean wine of fair quality, but light color; bouquet and flavor undeveloped.

*November 5.* (In glass.) Flavor better than in keg, and acid higher; general quality more advanced.

1890. *February 10.* Lees show both lactic and bitter ferments.

*February 15.* Clear and light colored; both flavor and bouquet injured by lactic taint.

*February 18.* Racked; lees showed lactic germs.

*July 23.* Wine discarded.

*No. 1141. Mourastel.* From J. Gallegos, Mission San José. The grapes arrived October 4, 1889, and were crushed the same day, juice showing 23.70 per cent of solid contents. They were in good condition, and mature. Bunches large, and grapes of good size, corresponding to Pulliat's description. Fermentation commenced October 6th at 72°. and reached its maximum of 86° on the following day. The murk was drawn off October 8th, three and one half days from crushing. From 67 pounds crushed, 5.56 gallons were obtained, corresponding to 166 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *December 4.* Racked and taken to cellar. Wine bright, dark-colored, and of good quality, with agreeable flavor, clean but raw taste, and undeveloped bouquet.

1890. *January 23.* Bouquet still not advanced, but general quality about the same as above. Lees show a considerable amount of acetic germs. Pasteurized.

*June 12.* Clear, much improved.

*July 8.* Bright; racked.

*August 4.* Lees show encrusted lactic ferments.

1891. *January 7.* Bright, little bouquet, but good flavor; sound, but over-mature.

*March 15.* Bottled.

*No. 1168. Mourastel.* From J. T. Doyle, Cupertino. The grapes arrived October 15, 1889, and were crushed the same day. Juice showed 22.90 per cent of solid contents. They were in good condition, and mature. Bunches over size, irregularly conical, heavily shouldered and close; grapes medium size, slightly ellipsoidal; skin thick, rich in color and covered with bloom; flesh very firm and crisp; stems thick and tough; pedicels medium length; the grapes contained very few seeds. Fermentation commenced October 17th and reached its maximum of 83° on the following day. The murk was drawn off October 19th, four days from crushing, being dry. From 80½ pounds crushed, 6.75 gallons were obtained, corresponding to 168.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *December 6.* Racked and taken to cellar. Condition clear with fair color, faint and peculiar bouquet, agreeable flavor; taste, a little of wood; medium acid and body; full astringency; quality good.

1890. *January 24.* Wine is improved in flavor, but the bouquet is about the same. Lees sound.

*April 29.* Racked again; flavor good; taste of acetic.

*May 16.* Lees show some acetic germs.

*June 12.* Generally good and improved but for slight acetic taint.

*December 31.* Lees show some acetic germs.

1891. *January 2.* Little changed, nearly mature.

*February 18.* Wine in keg bottled.

### *Discussion of Results.*

From the above record it appears that the Mourastel is a heavy bearer, even when pruned long, but as may be seen from the tabulated data it produces more when pruned short. In this respect, compared to all other grape varieties of the same type (southern France), we can regard it as the heaviest bearer, provided it is planted in locations and soils suitable to its nature.

The saccharine strength of this variety cultivated in the Cupertino and Mission San José plots, varied from 20.24 to 27.65 per cent; but when gathered at the proper time it varies from 23 to 24 per cent, and then it shows also an adequate acidity.

It produces a wine of about 11.50 per cent of alcohol by volume, but less colored than the Sirah and the Mondeuse, and more than the Mataro. On the whole, its wine has medium astringency and acidity and rather good body, it keeps well, and when mature, seems of good quality. Such is the result of our observations at the Experimental Cellar, and while the product is not as high as reported from France, it is sufficiently satisfactory to justify the recommendation of its culture in California, and its vinification, principally for blending purposes. It seems to be a good fermenter.

## Trousseau.

This variety, on account of its good qualities, is now widely cultivated in the Jura region of France, and it is remarkable for its strong growth, which allows it to develop well in all clayey, cool, and deep soils. It resists very well the spring frosts, the dryness of the summer, and the moisture of autumn. It is, however, liable to suffer often from winter frosts, on account of the frequently incomplete maturity of its wood. Its wine is alcoholic, of a good taste and good keeper, and dark purple color.

Its leaves are of medium size, nearly round, downy, and very little sinuate; the bunches, of average size, almost cylindrical, compact, with ellipsoidal berries of medium size, of a purplish-black color, covered with bloom at maturity, which occurs early.

In California the Trousseau has been used for the purpose of overcoming the too pronounced character of the Zinfandel, and in several cases this blend has been remarkably successful, but in others it has been unsatisfactory. It has also been used for the making of port wine, but only fair results have been obtained, on account of its deficiency in body, acid, and tannin. We know that the best results from the Trousseau, both in France and in California, have been obtained when it has been made into a white wine, which, being of good quality at the beginning, improves considerably by aging and acquires a characteristic sherry flavor. As a red-wine grape, at least in California, it has proved to be of poor quality.

## ANALYSES OF WINES.

|                                                    | Date of Picking | MUST.                     |                      |                  |     | WINE.     |           |              |                        |                        |               |
|----------------------------------------------------|-----------------|---------------------------|----------------------|------------------|-----|-----------|-----------|--------------|------------------------|------------------------|---------------|
|                                                    |                 | Solid Contents by Spindle | Sugar by Copper Test | Acid as Tartaric | Ash | Alcohol   |           | Tannin       | Total Acid as Tartaric |                        | Volatile Acid |
|                                                    |                 |                           |                      |                  |     | By Weight | By Volume |              | At Pressing            | At Six to Eight Months |               |
| 1883—No. 159. J. T. Doyle, Cupertino*              |                 |                           |                      |                  |     | 11.15     | 13.50     | .040         |                        | .60                    |               |
| No. 160. M. Denicke, Fresno*                       |                 |                           |                      |                  |     | 10.63     | 13.10     | .172         |                        | .65                    |               |
| 1884—No. 230. Geo. West, Stockton                  | Oct. 15         | 23.94                     |                      | .33              |     | 11.23     | 13.73     | .075         | .45                    | .49                    |               |
| No. 231. Wm. Pfeffer, Guberville                   | Oct. 18         | 22.87                     | 22.85                | .52              | .30 | 10.54     | 13.00     | .046         | .47                    | .71                    | .18           |
| No. 161. C. A. Wetmore, Livermore*                 | Sept. 21        | 18.56                     |                      | .83              | .41 | 9.78      | 12.18     | .041         |                        | .44                    |               |
| 1885—No. 341. J. Gallegos, Mission San José        |                 |                           |                      |                  |     | 9.20      | 11.45     | No wine made |                        |                        |               |
| No. 408. Father Cichi, Santa Clara*                |                 |                           |                      |                  |     | 10.63     | 13.09     | .080         | .45                    | .66                    |               |
| 1886—No. 469. Gov. Stanford, Vina                  | Aug. 28         | 23.70                     |                      | .41              | .59 | 10.07     | 12.54     |              |                        |                        |               |
| 1887—No. 710. J. T. Doyle, Cupertino               | Oct. 8          | 30.80                     | 29.83                | .49              | .45 | 13.15     | 16.20     | .243         | .46                    | .75                    |               |
| No. 690. Margherita Vineyard, Fresno               | Aug. 28         | 25.67                     | 25.76                | .38              | .44 | 10.54     | 13.00     | .186         | .47                    | .65                    | .15           |
| 1888—No. 872. Margherita Vineyard, Fresno          | Sept. 28        | 28.47                     | 28.33                | .34              | .82 | 11.62     | 14.20     | .160         | .33                    | .58                    | .280          |
| No. 873. J. T. Doyle, Experimental Plot, Cupertino | Sept. 29        | 23.07                     | 23.13                | .45              | .36 | 8.27      | 10.36     | .171         | .43                    | .60                    | .380          |
| 1889—No. 1055. Margherita Vineyard, Fresno         | Sept. 2         | 28.00                     | 28.62                | .44              | .40 | 13.17     | 18.50     | .185         | .51                    | .41                    | .260          |
| 1890—No. 1204. Margherita Vineyard, Fresno         | Aug. 12         | 22.27                     | 22.06                | .58              | .52 | 8.84      | 11.00     | .084         | .47                    | .43                    | .236          |
|                                                    |                 |                           |                      |                  |     |           |           |              |                        |                        | .260          |

\*Wines sent for examination. †Young vines, and grapes not fully ripe. ‡Sugar, 3.45 per cent. §Fortified.

a April, 1885. b November, 1885. c November, 1886. d June, 1887.

## COLOR READINGS.

| TROUSSEAU.         | 1886.                |           | 1887.                       |                                          | 1888.                                  |                                                    | 1889.                       |
|--------------------|----------------------|-----------|-----------------------------|------------------------------------------|----------------------------------------|----------------------------------------------------|-----------------------------|
|                    | Goy, Stanford, Vina. | No. 469.  | Martheria Vineyard, Fresno. | J. T. Doyle, Cupertino.                  | Martheria Vineyard, Fresno.            | J. T. Doyle, Cupertino.                            | Martheria Vineyard, Fresno. |
|                    |                      |           | No. 680.                    | No. 710.                                 | No. 872.                               | No. 873.                                           | No. 1055.                   |
| At pressing } Date | Sept. 7.             | Sept. 8.  | Oct. 20.                    | Oct. 5.                                  | Oct. 6.                                | Sept. 18.                                          |                             |
| { Color            | 8.0 3 R.             | 3.7 O. R. | 12.9 3 R.                   | 3.2 3 R.+2 Y.                            | 8.5 2 R.<br>6.5 R.+1 Y.<br>5.5 R.+1 Y. | 5.8 1 V. R.+2 Y.<br>4.7 2 R.+2 Y.<br>4.7 2 R.+2 Y. |                             |
| One month          |                      |           |                             | Can no longer be read in the instrument. | 3.9 3 R.+1 Y.<br>3.9 2 R.+1 Y.         |                                                    |                             |
| Two months         |                      | O. R.     | 12.5 3 R.                   |                                          |                                        |                                                    |                             |
| Three months       |                      | 5.0 O. R. | 10.0 4 R.                   |                                          |                                        |                                                    |                             |
| Four months        |                      |           |                             |                                          |                                        |                                                    |                             |
| Five months        |                      |           |                             |                                          |                                        |                                                    |                             |
| Six months         |                      |           |                             |                                          |                                        |                                                    |                             |
| Seven months       | 5.0 O. R.            | 4.5 O. R. |                             |                                          |                                        |                                                    |                             |
| Eight months       |                      |           |                             |                                          |                                        |                                                    |                             |

**No. 680. Trousseau.** From Margherita Vineyard, Fresno. The grapes arrived in good condition, August 31, 1887. Bunches closely packed and medium size, largely with one branch as a shoulder, length averaging six and a half inches. No coulure; somewhat unevenly ripe; skins entirely devoid of astringency, and thick and tough. The juice showed 25.60 per cent of solid contents. Fermentation of 67 pounds of grapes crushed began on September 1st, and reached its maximum of 79° on the 5th. It was drawn off on September 8th, nine days from crushing. The yield from the above amount was 5½ gallons, or at the rate of 157 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. January 16.** Racked and pasteurized the wine for safety.

*February 16.* Tastes somewhat acetified.

*May 5.* Condition bright, with insignificant bouquet; slight acetous odor.

*May 28.* The sediment shows some acetic and lactic ferments. Poor quality.

**No. 710. Trousseau.** From J. T. Doyle, Cupertino. The grapes arrived October 11, 1887, and were crushed the same day. They were very overripe, fully 20 per cent almost raisins; otherwise in good condition; coulure slight; bunches packed and very characteristic; berries exceedingly sweet. The juice showed 30.80 per cent of solid contents. Fermentation of 109 pounds crushed began on the morning of October 12th, and reached its maximum of 83° on the 14th, being quite violent in its action for three days. The fermentation having subsided, and the wine being still sweet, it was, on October 17th, heated up to 87° by stirring with a can filled with hot water; this operation was again repeated on October 19th, the temperature having fallen to 77°. On October 20th it was drawn off. The yield from the above amount of grapes was 7½ gallons, or at the rate of 144 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. December 13.** A bright-conditioned and pleasant wine that tastes almost dry.

*1888. January 26.* Racked the wine from the lees.

*February 8.* Condition not perfectly bright, with a dry taste, heavy body; wine almost a cordial, and rather bitterish and astringent.

*April 18.* A microscopical examination of the sediment shows some lactic and acetic ferments. Racked and pasteurized the sample.

*June 20.* Condition almost bright, with a port-like taste, very well-advanced bouquet, heavy body and astringency, bitterish in after-taste.

**No. 872. Trousseau.** From Margherita Vineyard, Fresno. The grapes arrived October 1, 1888, in overripe condition, and were worked the same day. Many bunches had raisins; berries quite large; juice very sweet. The must showed 28.47 per cent of solid contents. Fermentation of 97 pounds crushed began on October 2d, in the "hot-box" at 90°, and reached its maximum of 93.5° on the 4th. The murk was drawn off on October 5th, four and one half days from crushing. The yield from the above amount was 7½ gallons, corresponding to 157.2 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1888. December 3.** Taken to the cellar. Wine not very clear, with bouquet undeveloped, medium body and acid, full alcohol, and clean taste. Lees contained traces of lactic ferment.

*1889. January 12.* "A fair, but hot wine, without character. Blends badly with the Gamay Teinturier." (E. W. H. and F. P.)

*March 9.* Pasteurized.

*May 16.* Racked; condition cloudy.

*August 9.* Condition not quite bright; light color; suspicious bouquet; flavor not marked; clean taste; medium body and acid; full astringency and alcoholic strength; quality fairly good; it stands fairly well dilution.

*1890. February 5.* Lees full of lactic ferments.

*February 16.* Condition clear; wine completely spoiled by lactic fermentation. Discarded.

*No. 873. Trousseau.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived in excellent condition on October 2, 1888, and were crushed the same day. Bunches compact and characteristic, a few bunches have raisins; coulure not more than 2 or 3 per cent; stems green; berries oval and black, very unlike the ones from Fresno. The size of berries is much smaller than in the Fresno sample, and also smaller this year than the same grape from the same place last year. Juice showed 23.07 per cent of solid contents. Fermentation of 170 pounds crushed began October 3d, and reached its maximum of 93° on the following day. The murk was drawn off four days from crushing. The yield from the above amount was 13½ gallons, corresponding to 154.4 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *January 3.* Racked.

*January 18.* Taken to cellar.

*March 9.* Sediment contains a small quantity of lactic ferment; pasteurized.

*May 15.* Racked again; wine cloudy.

*August 9.* Condition not quite bright; light and yellowish color; undeveloped bouquet; suspicious flavor; medium body, astringency, and alcohol, and full acid; quality passable; stands dilution fairly well except for color.

*1890. February 5.* Lees contain a few lactic ferments.

*February 25.* Condition clear; wine of a poor quality.

*March 3.* Racked.

*July 23.* Discarded, being spoiled.

*No. 1055. Trousseau.* From the Margherita Vineyard, Fresno. Bunches large and heavy, with large and detached shoulders; berries round and very close, but not compressed; skin tough, thick, and astringent, with little color; flesh rather firm and juicy; condition fair; quite ripe. The grapes arrived September 5, 1889, and were crushed the following day, juice showing 28 per cent of solid contents. Temperature of mash, 70°. No sign of fermentation was perceived until September 8th; the cap began to form the 9th (temperature, 72.5°), and fermentation continuing slowly, reached its maximum of 79.5° on September 11th. On the 14th the fermentation was still going on gently, temperature 78°; the solid contents on this day was still 19.5. On September 16th a slight odor of vinegar was perceptible. The wine was still fermenting on September 18th, twelve days after crushing, when it was drawn off. The wine on September 20th showed 11.5 per cent of solid contents, when it was fortified. Yield from the above amount was 12.88 gallons, corresponding to 149 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *September 20.* Solid contents by spindle, 11.5; fortified.

*1890. January 6.* Condition bright; moderately deep color with strong tendency to orange; a not very marked bouquet, an agreeable flavor, similar to port; full astringency, low acid; sugar rather high; quality good.

*January 9.* "Makes a good blend with No. 1051 (Teinturier Mâle) in the proportion of one third of the former to two thirds of the latter." (E. W. H.)

*January 13.* Racked. One and one fourth gallons blended with No. 1051; 11½ gallons remaining were put in hot-box at the temperature of 90° to 95° on January 14th.

*May 14.* Racked and removed from hot-box.

*1891. January 26.* Bright; good aroma and body; somewhat too sweet, otherwise a good port.

*January 22.* Not quite clear; has a slight suspicion of acetic odor.

### *Discussion of Results.*

In glancing at the above record it is seen that the Trousseau may reach a high proportion of sugar, even in a cool region; in fact, at the Cupertino Experimental Plot, in 1887, the saccharine strength was 29.83

per cent, a little more than was observed on the grapes of the same variety from Fresno; in general, it has shown to be a highly sweet grape, with but little acidity.

The wine is exceedingly light in color, but very alcoholic and heavy-bodied; rather deficient in tannin and in acidity, when we consider the latter in relation to the other ingredients of the wine. The samples worked in our Experimental Cellar confirm the experience that the wine is of poor, or only fair quality, and not a good keeper; also, that it is unsuitable for blending with clarets; blended, however, with Teinturier in the proportion of one third to two thirds of the latter, and treated as a port wine, it has given a rather satisfactory sample; nevertheless, we still think that a better product may be obtained from it in using it for white wine.

It is noticeable that in the case of No. 710, from Cupertino, the wine was fermented practically to dryness, attaining 16.20 per cent of alcohol by volume by the aid of heat alone, while No. 1055, from Fresno, with 2 per cent less of sugar, failed to go through without such aid, and had to be made into port to prevent spoiling. It would doubtless have done well in the temperature of its native climate. In fact, the sample No. 872, also from Fresno, that had 28.33 per cent of sugar, being fermented in a hot-box at the temperature of 90°, it went through in four days and a half, while its acidity was lower than sample No. 1055. However, when the sugar contents was lower, as in the case of Nos. 680 from Fresno and 873 from Cupertino, the rise of the temperature of the fermenting mash, or of the room, was not necessary, for they went through easily. This would prove that a uniform hot temperature should not check the fermentation, even in case of musts containing high sugar percentages and adequate acidity, which, as is known, would be dangerous, should violent fermentation start in from the beginning. But though in a uniform hot temperature a regular fermentation might be obtained, the danger of the rapid development of secondary ferments cannot be avoided, as is well illustrated by our samples of Trousseau wines fermented at high temperature, which were full of lactic ferment, while the samples fermented at the ordinary temperature were only slightly attacked by lactic and acetic ferments; their fair character is simply due to the inherent poor keeping qualities of the variety itself, when it is worked alone in the making of a red dry wine.

#### GRENACHE.

The Grenache is pretty well known in this State, as it has been for some time quite extensively cultivated in the Santa Clara Valley, and to some extent in that of Napa. It is a variety belonging to northern Spain and southern France, and noted there for its vigorous growth and productiveness, under the short-pruning system, but requires rich soils; in these it comes into bearing remarkably early. Its wines are rather heavy-bodied and rich in alcohol, of a moderately deep-red color, which tends to become brownish or yellowish with advancing maturity. This tendency to lose its color has been prominently noted in California, as also the strongly pronounced "caramel" taste of its more mature wines, that, while much liked by some, is objectionable to others. On account of this pronounced flavor, it cannot, evidently, serve for blending with wines of delicate bouquet.



## ANALYSES OF WINES.

| GRENACHE.      | MUST.           |                           |                        |                  | WINE. |           |           |        |                         |                        |               |      |     |
|----------------|-----------------|---------------------------|------------------------|------------------|-------|-----------|-----------|--------|-------------------------|------------------------|---------------|------|-----|
|                | Date of Picking | Solid Contents by Spindle | Sugar by Copper Test.. | Acid as Tartaric | Ash   | Alcohol.  |           | Tannin | Total Acid as Tartaric. |                        | Volatile Acid | Body | Ash |
|                |                 |                           |                        |                  |       | By Weight | By Volume |        | At Pressing             | At Six to Eight Months |               |      |     |
|                |                 |                           |                        |                  |       |           |           |        |                         |                        |               |      |     |
| 1883—No. 86.   | Sept. 24        | 21.69                     | 21.38                  | .75              | .30   | 9.20      | .087      | .51    | .33                     | .13                    | 2.56          | .32  |     |
| No. 85.        | Sept. 10        | 22.15                     |                        | .44              | .33   | 9.70      | .109      | .42    | .53                     | .08                    | 2.69          | .43  |     |
| 1884—No. 131.  |                 |                           |                        |                  |       | 9.78      | .093      |        | .54                     |                        | 2.17          | .22  |     |
| No. 240.       | Sept. 4         | 21.82                     | 21.75                  | .62              | .26   | 8.48      | .105      | .49    | .48                     |                        | 1.67          | .28  |     |
| No. 241.       | Oct. 18         | 18.12                     |                        | .41              |       | 7.43      | .065      | .51    | .53                     |                        | 1.91          | .28  |     |
| 1885—No. 401.  |                 |                           |                        |                  |       | 9.85      | .127      | .69    | .30                     |                        | 2.69          | .24  |     |
| 1886—No. 595.  |                 |                           |                        |                  |       | 8.62      | .1075     | .43    |                         |                        | 2.60          | .28  |     |
| No. 571.       |                 | 23.50                     | 22.95                  | .20              | .24   | 10.26     | .202      | .45    | .70                     | .13                    | 2.60          |      |     |
| 1887—No. 712.  | Oct. 8          | 24.82                     | 24.97                  | .53              | .32   | 10.44     | .217      | .51    | .71                     | .08                    | 2.40          |      |     |
| No. 736.       | Oct. 11         | 24.85                     | 24.12                  | .58              | .32   | 10.44     | .217      | .51    | .43                     |                        | 2.60          |      |     |
| No. 685.       | Sept. 19        | 24.50                     | 24.12                  | .49              | .35   | 9.92      | .236      | .50    | .50                     |                        | 6.60          |      |     |
| 1888—No. 831.  | Sept. 7         | 30.29                     | 31.48                  | .27              | .66   | 11.00     | .345      | .350   | .51                     | .70                    | 2.85          |      |     |
| No. 854.       | Sept. 14        | 26.68                     | 26.99                  | .29              | .54   | 11.39     | .1391     | .251   | .53                     | .58                    | 2.85          |      |     |
| No. 871.       | Sept. 25        | 25.39                     | 24.22                  | .32              | .32   | 10.44     | .1291     | .301   | .43                     |                        | 2.85          |      |     |
| 1889—No. 1056. | Sept. 6         | 28.40                     | 28.33                  | .48              | .51   |           |           |        | .32                     | No wine.               |               |      |     |
| 1890—No. 1249. | Aug. 24         | 24.10                     | 23.72                  | .57              | .40   | 9.70      | .1209     | .153   | .55                     |                        | 3.02          |      |     |
| No. 1333.      | Oct. 11         | 24.35                     |                        | .62              |       |           |           |        | .46                     | No wine.               |               |      |     |

\* Wines sent for examination.

## COLOR READINGS.

| GRENACHE.                    | 1886.                   |                              |          | 1887.                   |                           |                              | 1888.                             |                         |                                 | 1889.     |
|------------------------------|-------------------------|------------------------------|----------|-------------------------|---------------------------|------------------------------|-----------------------------------|-------------------------|---------------------------------|-----------|
|                              | J. T. Doyle, Cupertino. | Margherita Vineyard, Fresno. | No. 595. | J. T. Doyle, Cupertino. | J. Bergin, Mountain View. | Margherita Vineyard, Fresno. | A. Caminetti, Jackson, Amador Co. | J. T. Doyle, Cupertino. | Margherita Vineyard, Fresno.    | No. 1056. |
| At pressing { Date . . . . . | Oct. —.                 | Oct. 1. O. R.                |          | Oct. 20. 21.6 4 V. R.   | Oct. 24. 24.8 5 V. R.     | Sept. 24. 6.1                | Sept. 24. 7.3                     | Oct. 3. 19.5 4 V. R.    | Sept. 13. 3 percent 1 R. + 2 Y. |           |
| One month { Color . . . . .  | -----                   | 6.8                          | -----    | 20.0 4 V. R.            | 17.4 4 V. R.              | 6.0 4 V. R. + 2 Y.           | 6.6 1 R. + 2 Y.                   | 17.4 4 V. R.            | -----                           |           |
| Two months . . . . .         | 14.9 4 V. R.            | 5.0 O. R.                    | -----    | 14.9 5 V. R.            | 13.9 R.                   | 4.7 3 R. + 2 Y.              | 5.7 1 R. + 2 Y.                   | 16.6 5 V. R.            | -----                           |           |
| Three months . . . . .       | -----                   | 5.0 O. R.                    | -----    | -----                   | -----                     | -----                        | 5.9 R. + 2 Y.                     | 10.3 1 R.               | -----                           |           |
| Four months . . . . .        | -----                   | 5.0 O. R.                    | -----    | 10.0 1 R.               | 11.4 5 V. R.              | -----                        | -----                             | 11.4 1 R.               | -----                           |           |
| Five months . . . . .        | -----                   | 5.0 O. R.                    | -----    | -----                   | -----                     | -----                        | -----                             | -----                   | -----                           |           |
| Six months . . . . .         | -----                   | 5.0 O. R.                    | -----    | -----                   | -----                     | -----                        | -----                             | -----                   | -----                           |           |
| Seven months . . . . .       | -----                   | 5.0 O. R.                    | -----    | -----                   | -----                     | -----                        | -----                             | -----                   | -----                           |           |
| Eight months . . . . .       | -----                   | 5.0 O. R.                    | -----    | -----                   | -----                     | -----                        | -----                             | -----                   | -----                           |           |

*No. 685. Grenache.* From Margherita Vineyard, Fresno. The grapes arrived September 22, 1887, and were crushed the same day. Condition was fairly good, somewhat wilted, but very dusty, necessitating washing. Juice showed 24.50 per cent of solid contents. Fermentation of 148 pounds crushed began on September 22d, reached its maximum of 83° on the 27th, when the action was very violent; from September 28th the action subsided. It was drawn off on October 1st, ten days from crushing. The yield from the above amount was 11 $\frac{3}{8}$  gallons, or at the rate of 153 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 19.* Condition bright, quite high astringency, and Grenache taste very pronounced; the wine is apparently more fit for port than anything else.

1888. *January 18.* Racked.

*February 16.* Condition bright, with a peculiar, strongly "burnt-sugar" bouquet; heavy body, and very pronounced astringency. A well-developed wine of decided port character, but needs blending to make it palatable.

*May 31.* Condition bright, with the same bouquet as at last tasting; good vinous flavor, medium acid, and high astringency.

*June 1.* Racked; found no abnormal ferments.

1889. *November.* (In bottle.) Bright; color light and yellowish, with faint bouquet, agreeable flavor, and clean and well-developed taste; medium body and acid, and full astringency; quality rather good, although the wine is somewhat exhausted, not having improved much by age.

*No. 712. Grenache.* From J. T. Doyle, Cupertino. The grapes arrived October 11, 1887, and were crushed the same day; condition good, size of berries uniform; early coulure to the extent of some 20 per cent makes the bunches rather loose. Berries very sweet, yet with plenty of acid. The juice showed 24.82 per cent of solid contents. Fermentation of 94 $\frac{1}{4}$  pounds crushed began October 12th, reaching its maximum of 82° on the 15th, the fermentation being very violent, and was drawn off October 20th, nine days from crushing. The yield from the above amount was 7 $\frac{3}{8}$  gallons, or at the rate of 152 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 13.* A clean-tasted, characteristic, and sound wine, with rather marked astringency.

1888. *January 25.* The young wine was racked and pasteurized, as the microscope showed lactic germs.

*February 8.* Condition bright, with high alcoholic strength, medium acid, moderate astringency, pronounced "burnt-sugar" taste; a pleasant, smooth, and fairly developed wine.

*June 16.* Condition bright, not heavy body, well-proportioned acid and astringency. The wine as a whole is thin. The microscope shows the sediment to still contain lactic germs.

1889. *November.* Condition bright, with rather light color, only fair bouquet, peculiar but pleasant flavor, clean taste, good body, and full acid and astringency; quality as a whole good.

*No. 736. Grenache.* From J. Bergin, Mountain View, Santa Clara County. Grapes arrived October 14, 1887, and were crushed the following day. Condition very good, just ripe, but stems full and green. Considerable coulure, hence bunches were quite loose, but large. Bunches fair size, with heavy bloom; skins quite thick; berries very sweet. The juice showed 24.85 per cent solid contents. Fermentation of 55.75 pounds crushed began October 16th, and reached its maximum of 82° on the 18th, fermentation being very violent. On October 24th it was drawn off, nine days from crushing. The yield from the above amount was 3 $\frac{1}{8}$  gallons, or at the rate of 137 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 16.* The "burnt-sugar" taste is pronounced. A clean-tasted wine with decided astringency.

1888. *January 26.* Racked and pasteurized for safety.

*February 8.* A bright and well-conditioned wine, well developed and smooth, with a strong "burnt-sugar" taste.

Unfortunately this wine was not tasted again till June 18th, when it was found to have become acetified to a serious extent.

*No. 831. Grenache.* From Margherita Vineyard, Fresno. Grapes arrived and were crushed September 10, 1888. Condition not good; over-ripe, with a large amount of half-dried grapes; berries quite light-colored; stems mostly dried. Bunches quite large, and all shouldered on one side; taste very sweet and raisin-like; acid entirely covered by sugar; skin very tough. The juice showed 30.29 per cent of solid contents. Fermentation of 242 pounds crushed began on September 13th, but being slow the mash was placed in hot-box (90°), and reached its maximum of 88° on October 24th, fourteen days from crushing, when the murk was drawn off. The yield from the above amount was 18½ gallons, corresponding to 154.9 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 1.* The wine kept in a 10-gallon keg seems almost dry; a portion kept in a 2-gallon demijohn is not nearly so, and was placed in the hot-box kept at 90°, after adding a pint of lees from Gros Mansenc, No. 931.

*November 14.* The wine in the demijohn was dry and was taken from the hot-box.

*December 19.* The wine was racked and removed to the cellar; the deposit of lees was very large.

1889. *January 12.* A tasting showed the wine to be uncertain in character, verging on port.

*January 28.* The lees showed both acetic and lactic ferments, and the wine was pasteurized.

*April 1.* Wine sour.

*May 16.* Racked again.

*August 6.* Condition not quite bright; color light, very yellowish; the bouquet, flavor, and taste were unpleasant and acetified; the acid very high, and tannin medium; quality very poor.

*November 4.* One half gallon dimijohn sample distilled; too poor to keep.

1890. *February 1.* Lees small in amount; show little lactic ferment. Quality poor for dry wine.

*No. 854. Grenache.* From A. Caminetti, Jackson, Amador County. Grapes arrived on September 18, 1888, and were worked the same day. Condition fair; stems nearly all dry and berries somewhat wilted, over-ripe, quite light-colored, and uneven in tint; berries rather undersized for the variety, and will make little or no color in wine. Juice showed 26.68 per cent of solid contents. Fermentation of 20.5 pounds crushed began on September 19th, and reached its maximum of 90° on the 21st. On September 24th, six days from crushing, the murk was drawn off. The yield from the above amount was 1½ gallons, corresponding to 158.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 19.* Racked; lees small in amount, with a very alcoholic taste; undeveloped bouquet; medium acid and tannin.

1889. *April 3.* Racked; condition clear, with light but good color; rather pleasant taste, but with acetic taint.

*April 5.* Lees examined under the microscope show a small quantity of lactic ferments; pasteurized the wine.

*June 1.* Racked again.

*August 6.* Condition bright, with very light and yellowish color, poor bouquet; bitter flavor and taste; medium acid and astringency, and adequate alcohol; quality poor, improved by a little water.

*November 5.* Wine has lost its bitterness since last tasting; generally improved, but still has a bitter flavor.

1891. *February 11.* Wine much deteriorated, and sample discarded.

*No. 871. Grenache.* From J. T. Doyle, Cupertino. Grapes arrived September 28, 1888, in good condition, and were crushed the same day. Early coulure in some bunches to the extent of 25 per cent; on others scarcely any; a few dried berries. Berries, owing to late coulure, uneven in size; mature and full bunches quite typical. Compared with the Fresno sample, the berries are smaller and darker and bunches looser. Juice showed 25.39 per cent of solid contents. Fermentation of 163 pounds crushed began on September 30th, and reached its maximum of 92° the following afternoon. On October 3d the murk was drawn off, five days from crushing. Yield from the above amount was  $13\frac{5}{16}$  gallons, or at the rate of 163 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *October 29.* Action ceased. Placed in cellar.

*December 12.* Wine clear, with vinous flavor, medium alcohol, and somewhat high acid; development well advanced.

1889. *January 12.* Heavy, with little color and much "burnt-sugar" flavor.

*March 18.* Sediment shows traces of lactic germs; pasteurized.

*May 16.* Racked; condition clear.

*August 6.* Condition bright, with light-red color, unpleasant bouquet and flavor, but not a bad after-taste; medium acid and astringency; quality poor, but becomes fair on dilution with a little water.

1890. *February 5.* Lees sound.

*February 23.* A bright, thin, and exhausted wine, but with improved flavor.

*February 27.* Racked.

*August 15.* Bottled.

1891. *February 12.* Wine bottled May 16, 1889, spoiled. Wine bottled February 27, 1890, good, much improved in bottle; little bouquet, but full flavored, bright, and mature. Wine bottled August 13th similar to the above.

*No. 1056. Grenache.* From Margherita Vineyard, Fresno. Bunches medium size, well filled, and heavily shouldered; stems very thick and strong; skin tough, with little color; flesh soft and juicy; condition fair, but overripe; only two baskets (6 pounds) were received. This variety arrived September 5, 1889, and was crushed the following day. The juice showed 28.4 per cent of solid contents. It fermented dry in five and one half days in a room whose temperature was 75°. The small amount obtained was studied only as regards color.

### *Discussion of Results.*

From the above record it will be seen that the time of maturity of the Grenache varied materially, according to the climate of the location; and, as is natural, has thus influenced the proportions of sugar and of acid in the grapes. We thus find high saccharine strength and low acidity in the grapes from the hot climates of Fresno and Amador, and the contrary in those from the cooler climate of the Santa Clara Valley. In the latter region, or in others having a similar climate, when the grapes are picked at the proper time, they yield a wine that on the average contains 12 per cent of alcohol by volume, and in general with an adequate acidity, and with rather good body and astringency; but in warmer regions if the grapes are not picked quite early they will produce a wine containing from 13 to 14 per cent of alcohol by volume, with a relative low acidity, but of high astringency and body. Such wine contains always a certain amount of undecomposed sugar, and is therefore liable to secondary fermentation. One of these last cases is illustrated in No. 831 from Fresno, in which the high proportion of acidity noted in the table is simply due to the presence of the abnormal acids, produced by the secondary fermentation, which attacked the wine.

The color of the Grenache, moderately red at first, soon becomes brownish and yellowish by aging.

In view of these peculiarities, the Grenache may be used in making good white wine when the grapes are in a good condition and picked early in order to have only a moderate amount of sugar in the must; or it may be used in making sweet fortified wines.

It may also be blended with other wines, such as the Mataro, Cabernets, Gamay, and Malbeck; but never with the Carignane, this blend being very unsatisfactory. When used for blending purposes the Grenache should never exceed the proportion of one tenth or one fifth at most, on account of its peculiarities mentioned in the introductory paragraph.

The wine of Grenache, when made in a proper manner, has certain good qualities which improve by aging, but without such precaution it is of poor quality and a poor keeper.

#### CINSAUT, OR BOUDALÈS.

The Cinsaut is widely distributed in the south of France, from the Alps to the Pyrénées. It yields a heavy-bodied but delicate and highly flavored wine, and for that reason is largely used in blends, to which it imparts its fine aroma, which is best developed at the age of about four years. It is, moreover, a most excellent table grape. The grape develops its best quality on the warmest slopes of dry, stony hills. On light soils its life is not long, unless well sustained with fertilizers and by very short pruning. It requires a good deal of heat; ripens early in the second period.

Bunches and berries large, fine, and very attractive looking, resembling somewhat the "Black Malvoisie" and sometimes mistaken for it; but the bunches are shorter and stouter. Berry rather firm, very sweet, but with sufficient acidity to render it very palatable. Unfortunately it will not bear shipment to any great distance, but does well for the local market.

In the Santa Clara Valley this grape has been grown under the singularly inappropriate name of "Black Pinot;" it is one of the many so-called "Burgundies" of that region, which seem to include every grape yielding but little color. Of course its extra large berry and bunch, its glossy, deeply-cut leaf, and low growth distinguish it pointedly from the true Pinots, and from nearly every other of the misnamed "Burgundies."

The French observation, that it develops its best qualities on dry hills, is well verified in California. On low, moist soil it makes a tasteless, watery grape of high acid and low sugar contents and lacks the peculiar aroma that constitutes one of its chief merits. To the fact that it was first planted in the cool coast climate of the Santa Clara Valley, must be attributed the slight degree of appreciation it has thus far received. It really belongs to the warmest parts of the State, and should there be propagated for the production of both dry and port wines.

TABLE OF PRODUCTION.

| CINSAUT.                                                | Number of Vines.. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs. .... | Date of Picking... |
|---------------------------------------------------------|-------------------|---------------------------------------|-----------------------------------|--------------------|
| 1887—No. 702 J. T. Doyle, Experim'tal Plot, Cupertino.  | 20                | 120                                   | 6.0                               | Oct. 6             |
| 1888—No. 950. J. T. Doyle, Experim'tal Plot, Cupertino. | 20                | 240                                   | 12.0                              | Nov. 5             |
| 1889—Row 54. J. T. Doyle, Experim'tal Plot, Cupertino.  | 20                | 150                                   | 7.5                               | Oct. 4             |

NOTE.—As the result of large-scale culture at Mission San José (E. W. Hilgard's vineyard), the product may be placed as rarely falling below four tons per acre; being above that figure as often as below it.

## ANALYSES OF WINES.

|                | CINSAUT.                        | Date of Picking | MUST.                     |                      |                  |     | WINE.     |           |        |                        |               |
|----------------|---------------------------------|-----------------|---------------------------|----------------------|------------------|-----|-----------|-----------|--------|------------------------|---------------|
|                |                                 |                 | Solid Contents by Spindle | Sugar by Copper Test | Acid as Tartaric | Ash | Alcohol   |           | Tannin | Total Acid as Tartaric | Volatile Acid |
|                |                                 |                 |                           |                      |                  |     | By Weight | By Volume |        |                        |               |
| 1884—No. 237.  | Natoma Company, Natoma          | Sept. 22        | 23.94                     |                      | 53               |     | 10.44     | 12.90     | .070   | .38                    |               |
| 1885—No. 345.  | J. Gallegos, Mission San José   | Sept. 22        | 18.58                     |                      | .54              | .25 | 7.37      | 9.18      | .040   | .51                    | 2.60          |
| 1886—No. 508.  | E. W. Hilgard, Mission San José | Oct. 2          | 20.10                     |                      | 1.13             | .40 | 7.78      | 9.73      | .153   | .90                    | 2.20          |
|                |                                 |                 |                           |                      |                  |     | 7.99      | 10.00     | .110   | .52                    |               |
| 1887—No. 565.  | E. W. Hilgard, Mission San José | Nov. 5          | 23.40                     | 23.32                | 1.00             | .39 | 8.84      | 11.00     |        | .51                    | 2.67          |
|                | J. Gallegos, Mission San José*  |                 |                           |                      |                  |     | 9.92      | 12.36     | .210   | .28                    | .43           |
| 1887—No. 702.  | J. T. Doyle, Cupertino          | Oct. 6          | 22.31                     | 23.05                | .55              | .36 | 8.13      | 10.17     | .157   | .45                    | 2.30          |
|                | E. W. Hilgard, Mission San José | Oct. 22         | 23.90                     | 23.61                | .69              | .44 | 9.49      | 11.82     | .167   | .68                    | 2.80          |
| 1888—No. 916.  | J. Gallegos, Mission San José   | Oct. 16         | 22.00                     | 23.13                | .47              | .31 | 8.84      | 11.00     | .122   | .36                    | 2.33          |
|                | E. W. Hilgard, Mission San José | Oct. 17         | 19.35                     | 20.24                | .39              | .27 | 7.85      | 9.82      | .084   | .32                    | 1.96          |
| 1889—No. 950.  | J. T. Doyle, Cupertino          | Nov. 5          | 20.90                     | 22.22                | .33              | .41 | 7.99      | 10.00     | .134   | .32                    | 2.45          |
|                | E. W. Hilgard, Mission San José | Oct. 2          | 22.14                     | 21.80                | .34              | .30 | 8.98      | 11.18     | .158   | .41                    | 2.70          |
| 1890—No. 1408. | J. Gallegos, Mission San José   | Oct. 26         | 22.35                     |                      | .47              | .21 | 9.92      | 12.36     | .122   | .44                    | 2.58          |

\* Wine sent for examination. † November, 1886. ‡ June, 1887.



## COLOR READINGS.

|                 | 1886.                            |          | 1887.                                      |           |
|-----------------|----------------------------------|----------|--------------------------------------------|-----------|
|                 | E. W. Hilgard, Mission San José. |          | J. T. Doyle, Experimental Plot, Cupertino. |           |
|                 | No. 509.                         | No. 565. | No. 580.*<br>(Black Pinot.)                | No. 772.  |
| Must. ....      | Pale rose.                       |          |                                            |           |
| At pressing {   | Oct. 10.                         | Nov. 16. | Nov.                                       | Oct. 13.  |
| Date. ....      |                                  | 8.8      |                                            | 19.0      |
| Color {         | 3 R.                             | 3 R.     | 4 R.                                       | 2 V. R.   |
| One month ..    | 6.0                              | 8.7      |                                            | 22.2      |
| Two months ..   | 6.3                              | 3 R.     |                                            | 3 V. R.   |
| Three months .. | Made<br>into<br>brandy.          |          |                                            | 7.4       |
| Four months ..  |                                  |          |                                            | 3 R.      |
| Five months ..  |                                  | 10.0     |                                            | 8.7       |
| Six months ..   |                                  | O. R.    |                                            | 4.5 V. R. |
| Seven months .. |                                  | 8.0      |                                            | 7.3       |
|                 |                                  | O. R.    |                                            | 4 V. R.   |
|                 |                                  |          |                                            | 7.3       |
|                 |                                  |          |                                            | 3-4 R.    |

\* Wine sent for examination.

## COLOR READINGS—Continued.

| CINBAUT.                | 1888.                                                   |                                          |                                                  |              | 1889.        |                               |
|-------------------------|---------------------------------------------------------|------------------------------------------|--------------------------------------------------|--------------|--------------|-------------------------------|
|                         | J. Gallegos,<br>Experimental Plot,<br>Mission San José. | E. W. Hilgard,<br>Mission San José.      | J. T. Doyle,<br>Experimental<br>Plot, Cupertino. | No. 950.     | No. 1143.    | No. 1143a.<br>With "Governo." |
| At pressing { Date..... | Oct. 22. R.                                             | Oct. 24.                                 | Oct. 12.                                         | Nov. 12.     | Oct. 7.      |                               |
| One month { Color.....  | 14.3 4 V. R.                                            | 4.5 5 V. R. + 1 Y.                       | 10.4 1 R.                                        | 17.7 5 V. R. | 17.7 5 V. R. |                               |
| Two months.....         | 9.3 1 R.                                                | 3.4 1 V. R. + 2 Y.                       | 8.0 1 R.                                         | 12.5 3-4 R.  | 12.5 3-4 R.  | 3-4 R.                        |
| Three months.....       | 7.6 1 R.                                                | } Out of limits<br>of the<br>instrument. | 7.3 4 R.                                         |              |              |                               |
| Four months.....        | 5.3 4 V. R. + 1 Y.                                      |                                          | 7.5 3 R.                                         |              |              | 4.3 1 R. + 1 Y.               |
| Five months.....        | 4.3 4 V. R. + 1 Y.                                      |                                          |                                                  |              |              | 4.2 2 R. + 1 Y.               |
| Six months.....         |                                                         |                                          |                                                  |              |              | 4.9 1 R. + 1 Y.               |
| Seven months.....       |                                                         |                                          | 2.0 3 R. + 1 Y.                                  |              |              | 4.8 3 V. R. + 1 Y.            |

*No. 702. Cinsaut.* From J. T. Doyle, Cupertino. The grapes arrived October 7, 1887, and were crushed the following day. Their condition was good, stems rather dry, but berries turgid and sound; coulure apparently less than at Mission San José, but a few prematurely dried berries are shriveled up. Will make a fair test of quality of wine, if not of weight of grapes. The latter are very sweet, apparently not quite as acid as at Mission San José. The juice showed 22.31 per cent of solid contents. Fermentation of 81 pounds crushed reached its maximum of 89° on October 10th. It was drawn off on the 12th, four days from crushing, showing a rapid fermentation. The yield from the above amount of grapes was 6½ gallons, or at the rate of 170 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 5.* Racked the young wine from the lees.

*December 19.* The wine has an aromatic and very agreeable bouquet, moderate and pleasant acid, lightish body, and low astringency.

1888. *February 16.* Condition bright, with quite pronounced bouquet, medium acid, and low astringency; the wine as a whole is well developed and smooth.

*May 28.* The microscope shows no unsound germs in the sediment, but the wine was racked and pasteurized for safety, as it was divided into smaller packages.

*June 19.* Condition bright and bouquet well advanced; acid and astringency well proportioned; a sound, smooth wine, of only medium body.

*No. 772. Cinsaut.* From E. W. Hilgard, Mission San José. The grapes arrived October 24, 1887, and were crushed the next day. Condition good, much coulure on bunches; many small, dried berries, somewhat flabby from standing in crates two days in hot weather, but none unsound; will make a tolerably fair test of the variety. The juice showed 23.90 per cent of solid contents. Fermentation of 55 pounds crushed began on October 25th very violently; reached its maximum of 82° on the 28th. It was drawn off on October 29th, four days from crushing. The yield from the above amount was 4½ gallons, or at the rate of 174.9 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 18.* Condition turbid, with a markedly aromatic bouquet, medium body, low astringency, and medium acid; slightly suspicious in quality; racked and pasteurized the wine for safety.

1888. *February 9.* Wine somewhat flat, but with pleasant acid, and quite pronounced, characteristic aroma.

*June 18.* Condition bright, with pleasant bouquet, medium acid, fair body, and low astringency. The sediment showed some acetic germs; it was racked again. A later examination showed such increase of acetification that the sample was abandoned.

*No. 916. Cinsaut.* From Experimental Plot, Mission San José; grafts from E. W. Hilgard's vines, two years from grafting. The grapes arrived October 18, 1888, and were crushed the following day. The juice showed 22 per cent of solid contents. Fermentation started October 20th, rising to 90° on the 21st. The wine was drawn off on October 22d, three days from crushing. From 122½ pounds crushed, 10.9 gallons of wine were obtained, corresponding to 177.55 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 8.* Taken to cellar.

*December 19.* Racked. Condition very turbid.

1889. *January 11.* Condition still very turbid.

*February 23.* Lees contain lactic germs. Pasteurized the wine.

*May 15.* Racked again.

*August 2.* A poor wine, not yet bright; bouquet and flavor slightly acetous.

1890. *February 10.* Sediment contains some acetic germs. A very poor wine.

*February 22.* Racked.

*July 15.* Lees contain acetic germs; wine bright, but thin and poor quality.

*No. 922. Cinsaut.* From E. W. Hilgard, Mission San José. Grapes were received October 19, 1888, and were crushed the following day, being previously washed. The juice showed 19.35 per cent of solid contents. Fermentation commenced on the afternoon of October 21st, and reached the maximum temperature of 88° on the following day. The murk was drawn off on October 24th, four days from crushing. From 110 pounds crushed 10.12 gallons were obtained, corresponding to 184.09 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 3.* Racked and taken to the cellar.

1889. *January 9.* A very pleasant wine, of better quality and bouquet than No. 950. Cinsaut, from Cupertino; after-taste slightly suspicious of lactic acid.

*February 23.* Sediment contains some lactic ferment; pasteurized the wine.

*May 15.* Racked again; condition cloudy.

*August 2.* A poor, flat wine; still cloudy.

1890. *February 10.* Lees contain lactic germs.

*February 17.* A bright wine, without color, but with a slightly improved flavor since last tasting.

*February 23.* Racked.

*July 17.* Lees show much lactic ferment; wine being of poor quality, was discarded.

*No. 950. Cinsaut.* From J. T. Doyle, Cupertino. Grapes arrived in good condition November 7, 1888, and nearly ripe, but still sound; some second crop, and some berries with almost no color. Average size of berries good, but much more coulure than at Mission San José. The grapes were crushed November 7th, the day of arrival. The juice showed 20.9 per cent of solid contents. Fermentation started on October 8th, and reached its maximum of 89.5° on the following day. On October 12th the murk was drawn off, four and one half days from crushing. From 108 pounds crushed, 9.12 gallons were obtained, or at the rate of 168.98 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 19.* Racked and taken to the cellar. Condition not clear.

1889. *January 9.* A mild and not unpleasant wine of advancing bouquet, clearing well.

*March 12.* Lactic ferment in sediment; pasteurized.

*May 15.* Racked; condition cloudy.

*August 9.* Condition clear; a very light and yellowish color; general quality fair.

1890. *February 11.* Lees full of apparently dead filiform germs.

*February 15.* Condition bright; wine not improved since last tasting; rather deteriorated.

*March 3.* Racked.

1891. *March 6.* Wine bottled in 1889 is completely spoiled; that bottled in 1890 is not so bad but also practically spoiled.

*No. 1143. Cinsaut.* From E. W. Hilgard, Mission San José. Grapes arrived in good order, and were crushed October 4, 1889, the day of their arrival. The juice showed 22.14 per cent of solid contents. Fermentation reached its maximum of 93.5° on the afternoon of October 6th; the murk was drawn off October 7th, three days from crushing. From 151 pounds crushed, 13.94 gallons were obtained, corresponding to 184.6 gallons per ton.

RECORD OF TREATMENT AND TASTING.—This wine, two weeks after pressing, was treated according to a method in use in Tuscany, called "*governo*."

This method, the object of which is the improvement of the quality and keeping power of any light wine which is likely to spoil during the warm days of early summer, consists in adding a certain quantity of other grapes to the wine to be treated. The grapes thus added are called the "*governo*," and should be of high quality, with good color and acid. They are placed on straw until they commence to shrivel, and are then crushed and added to the wine, which should be about one month old when treated.

The "*governo*" in this sample case consisted of—

|                    |                |
|--------------------|----------------|
| Gros Mansenc ..... | 64.5 per cent. |
| Refosco .....      | 17.8 per cent. |
| Barbera .....      | 17.7 per cent. |

In all nine pounds.

1889. November 16. Racked off from the "governo."

December 3. Condition cloudy, with light color, agreeable bouquet, very pleasing flavor, developed taste, medium acid, good body, and full alcohol and astringency; quality good.

December 13. Racked and taken to cellar. Condition not quite clear.

1890. January 23. Condition nearly clear, with a little flat taste, but otherwise very good; color very light. Lees sound.

May 2. Condition not quite clear, taste sound. Racked.

May 19. Lees sound.

June 10. Condition bright, with very light color; fresh and full flavor and good bouquet; a clean and well-developed taste; low acid and medium astringency; general quality good.

July 31. Lees show much "*pastorianus*" ferment.

August 14. A clear wine, with delicate and pleasing bouquet; low acid; well developed. The wine was racked on the 19th.

December 30. Lees show a very few lactic ferment.

1891. January 2. A bright wine, with lactic taint very slightly perceptible; quality rather thin.

March 23. Some wine bottled, and the rest pasteurized.

May 8. A bright wine, of light color, and very slightly suspicious in taste, but altogether a fair wine, much better than has been so far obtained from the same grape without the "governo."

### Discussion of Results.

In the Cupertino Experimental Plot the largest crop was obtained in 1888, at the rate of over 4 tons per acre, while in 1889 and 1890 it was only from 2.5 to 3.3 tons per acre, on account of much coulure and sunburn. At Mission San José (E. W. Hilgard's vineyard), the average has been 4 tons and over per acre, but the vines are older than those at Cupertino, and the grapes have not been damaged from coulure or sunburn; some moldiness was observed in 1890, after a heavy rain at the time of ripening. The Cinsaut has therefore been found to be a good bearer, if pruned short and placed in proper soil and climate.

In the coast region the Cinsaut, it will be noted, does not easily exceed 21 to 22 per cent of sugar. In its native country, southern France, it is reported that its must contains 24 per cent of sugar and .55 per cent of acidity as an average. About the same rate has been obtained in California, in 1884, by the Natoma grapes, the juice of which contained 23.94 per cent of sugar and .53 per cent of acid. Nearly the same amount of saccharine strength was reached in 1886 and 1887 (being, respectively, 23.40 and 23.61 per cent) at Mission San José, while the rate of acidity (except in the case of grapes of 1886, which, being very young, showed from 1 to 1.13 per cent), decreased every year, together with the sugar contents, making a poorly keeping wine. Tannin and color are always low, so that for red wine the grape cannot be blended.

The Cinsaut possesses a special aroma which it is desirable to preserve; an appropriate blending, or "governo," as practiced in Tuscany, with more colored, acid, and astringent grapes, would much improve its general quality and contribute largely to good keeping. Our sample treated by "governo" has shown a fair specimen of what could thus be obtained from this grape, especially with regard to the conservation of the wine. Other experiments on this point will be made hereafter, so as to see what will be the best "governo" to reach the "*desiderata*" in making dry wines. But it is eminently worth while to try the use of the Cinsaut in making port, as a blend, producing at an early age a striking and agreeable bouquet. This natural bouquet is the special merit of

this grape, and is produced most strikingly in warm climates; and it should not be planted elsewhere, for the wine produced in the cool coast region is thin and a poor keeper. It will be noted that it ferments rapidly and violently, as compared with other musts of similar sugar contents.

The Cinsaut makes a pleasant and strikingly flavored white wine, of early maturity, as will be reported in detail hereafter.

#### PLOUSSARD, OR POULSART.

The Ploussard is chiefly cultivated in eastern middle France, in the Jura and the adjacent region, where it forms the basis of the better and medium high-class wines, "the soul of the wines of the region where it is grown." It also enters into the Champagne wines, and is the chief ingredient of the sweet "liqueur" or "straw" wines of the same countries. It is also a good table grape, and as good a keeper as the Chasselas de Fontainebleau. It is a vigorous grower, and according to the quality of the soil should be pruned long, and even very long. Its full bearing qualities are sometimes not shown until its fifteenth or twentieth year. The selection of the proper bearing canes is extremely important, and vertical ones should be avoided.

The leaves are of medium to small size, elongated, smooth on both sides, and rather deeply cleft; therefore easily distinguished from those of the Malbeck (with which it has been confused in California), which are as broad as long, roughish, and shaggy below. Bunches short, conical, rather loose, and well shouldered. Berries elliptical, elongated; size medium or little over; skin thin and delicate, of a rather light, reddish-purple tint; very sweet and juicy. Matures in the second period.

TABLE OF PRODUCTION AT THE CUPERTINO EXPERIMENTAL PLOT.

| PLOUSSARD.                             |  | Number of Vines.. | Total Weight of Grapes in lbs.... | Average per Vine, in lbs..... | Date of Picking... |
|----------------------------------------|--|-------------------|-----------------------------------|-------------------------------|--------------------|
| 1887—Nos. 718, 719 (long-pruned) ..... |  | 20                | 54                                | 2.70                          | Oct. 11            |
| Nos. 718, 719 (short-pruned) .....     |  | 20                | 7                                 | .35                           | Oct. 11            |
| 1888—No. 843 (short-pruned) .....      |  | 20                | 50                                | 2.50                          | Oct. 13            |
| No. 843a (long-pruned) .....           |  | 12                | 105                               | 8.70                          | Sept. 13           |
| 1889—Row 24 (short-pruned) .....       |  | 19                | 50                                | 2.63                          | Sept. 20           |

| ANALYSES OF WINES. |                      | MUST.                          |  | WINE.                       |  |
|--------------------|----------------------|--------------------------------|--|-----------------------------|--|
|                    | Date of Picking..... | Solid Contents by Spindle..... |  | Alcohol.                    |  |
|                    |                      | Sugar by Copper Test...        |  | Tannin.....                 |  |
|                    |                      | Acid as Tartaric.....          |  | Total Acid as Tartaric.     |  |
|                    |                      | Ash .....                      |  | At Six to Eight Months..... |  |
|                    |                      |                                |  | At Pressing.....            |  |
|                    |                      |                                |  |                             |  |
|                    |                      |                                |  | Volatile Acid .....         |  |
|                    |                      |                                |  |                             |  |
|                    |                      |                                |  | Body .....                  |  |
|                    |                      |                                |  |                             |  |
|                    |                      |                                |  | Ash .....                   |  |
|                    |                      |                                |  |                             |  |

PLOUSSARD.

1886—No. 499. J. T. Doyle, Cupertino .....  
 1887—No. 718 (long-pruned). J. T. Doyle, Cupertino .....  
 No. 719 (short-pruned). J. T. Doyle, Cupertino .....  
 1888—No. 842. J. Gallegos, Mission San José .....  
 No. 843. J. T. Doyle, Cupertino .....  
 1889—No. 1059. J. Gallegos, Mission San José .....  
 1890—No. 1261. J. Gallegos, Mission San José .....  
 No. 1291. J. T. Doyle, Cupertino .....

\* January, 1886. † May, 1886.

## COLOR READINGS.

| PLOUSSARD.              | 1886.                   | 1887.                         | 1888.             | 1889.                             |
|-------------------------|-------------------------|-------------------------------|-------------------|-----------------------------------|
|                         | J. T. Doyle, Cupertino. |                               |                   | J. Gallegos,<br>Mission San José. |
|                         | No. 499.                | No. 718<br>(long-<br>pruned). | No. 843.          | No. 1059.                         |
| At pressing { Date..... | Oct. 6.                 | Oct. 21.                      | Sept. 20.         | Sept. 17.                         |
| { Color.....            | 5.9 3 R.                | 10.0 3 R.                     | 5.7 O. R.         | 9.0 V. R. +1 Y.                   |
| One month.....          | 5.8 3 R.                |                               |                   |                                   |
| Two months.....         | 4.9 3 R.                | 8.3 O. R.                     | 4.8 R. +2 Y.      | 5.0 3 R. +1 Y.                    |
| Three months.....       |                         |                               | 5.0 5 V. R. +2 Y. | 5.0 3 R. +1 Y.                    |
| Four months.....        |                         | 7.1 O. R.                     | 4.8 2 R. +2 Y.    | 4.2 3 R. +1 Y.                    |
| Five months.....        |                         |                               | 5.3 3 R. +2 Y.    |                                   |
| Six months.....         | 5.6 3 R.                |                               |                   |                                   |
| Seven months.....       |                         | 6.6 O. R.                     |                   |                                   |
| Eight months.....       | 5.5 3 R.                |                               |                   |                                   |

*No. 718 (long-pruned). Ploussard.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 12, 1887, and were crushed the following day. Their condition was fair, being somewhat overripe, some partly dried. Color and shape much like Cinsaut, but size less, and sweetness unaccompanied by acid, therefore flat and without zest. Some late coulure, many bunches showing berries buckshot size in great numbers. The juice showed 29.67 per cent of solid contents. Fermentation of 50.75 pounds crushed began on October 13th, continued slowly and at a low temperature until the 17th, when it was raised from 77° to 85° by a warm-water bottle. It then continued violently for twenty-four hours, when it again became necessary to elevate the temperature from 77° to 85°. The fermentation then continued actively until October 22d, when the temperature fell to that of room (70°), and at that time the murk was drawn off, nine days from crushing. The yield from the above amount was 3½ gallons, or at the rate of 143 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887.** *December 6.* Racked the young wine from the lees.

*December 19.* Condition bright, with pleasant bouquet; low acid and astringency; high body and alcohol; whole wine good; dessert and port-like.

*1888. February 9.* Condition bright, with bouquet fairly developed; heavy body; light astringency and acid; a smooth "liqueur" wine.

*April 23.* The sediment contains lactic and acetic ferments; wine racked and pasteurized.

*June 22.* Condition bright, with well-advanced bouquet and vinosity, medium acid, and very high alcoholic contents; wine tending toward port.

*1889. November.* (In bottle.) Condition not quite clear, light yellowish color, very faint bouquet, neutral flavor, a little suspicious taste, full acid, and medium astringency and alcohol; quality fair.

*No. 719 (short-pruned). Ploussard.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 12, 1887. Their condition was good, better than No. 718, stems greener and stouter, and fewer dried berries, the latter also larger, not overripe. Coulure about same in both. The juice showed 32.01 per cent of solid contents. Only a few grapes were received, so no wine was made.

*No. 843. Ploussard.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived in good condition September 14, 1888, and were crushed the same day. Some bunches full, others somewhat loose, with



early coulure; a few undersized berries. In exposed bunches there are dried and half-dried berries. Juice showed 25.01 per cent of solid contents. Fermentation of 147.5 pounds crushed began on September 15th, and reached its maximum of 90° on the 18th. On September 20th the murk was drawn off, six days from crushing. The yield from the above amount was 12 gallons, corresponding to 162.7 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Taken to the cellar.

*December 10.* Lees contained traces of lactic ferment; pasteurized; wine characteristically light-colored, but a little more than Ploussard generally has; alcohol fair, and tannin adequate; acid indicative of lactic taint.

1889. *March 29.* Racked.

*August 9.* Condition bright, with light and yellowish color, undeveloped bouquet, pleasant flavor, clean taste, medium body and astringency, full acid and alcohol, quality fair; stands dilution rather well.

1890. *February 1.* Lees contain much lactic ferment.

*February 23.* Condition clear; flavor intensely lactic. Racked.

*July 23.* No improvement. Discarded.

*No. 1059. Ploussard.* From J. Gallegos, Mission San José. This variety arrived September 12, 1889, in rather ripe condition, some of the grapes being quite dried, and some a little mashed and moldy. The grapes were sorted over, and about one fourth rejected. They were crushed on the day of arrival. The juice showed 26.3 per cent of solid contents. Fermentation of 61.75 pounds crushed commenced September 14th, the mash smelling a little moldy. The maximum temperature of 82.5° was reached on September 16th. On the 17th the murk was drawn off, being still a little sweet. The wine obtained was 5½ gallons, corresponding to 178 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 14.* Condition clear, with light and yellowish tinted color, good tannin, and agreeable taste.

*November 7.* Racked and taken to cellar.

1890. *January 13.* A clear wine, with a slightly bitter taste, and faint and not agreeable bouquet; quality fair; lees sound.

*April 3.* Racked.

*May 15.* Lees contain much lactic and acetic germs.

*May 19.* Pasteurized.

*June 13.* Clear, almost colorless, of very poor quality.

*August 4, September 3, December 31.* Tasting and examinations of lees show that the wine continues to deteriorate.

1891. *January 7.* Sample discarded.

### *Discussion of Results.*

The above record shows that the Ploussard is a very poor bearer when pruned short, and a moderate one only when pruned long; in fact, at the Cupertino Experimental Plot the crop gathered from the long-pruned vines, in the season of 1888, was at the rate of about 2.86 tons per acre, while that obtained from the short-pruned was, on the average for 1888 and 1889, at the rate of about 1,715 pounds per acre.

The characteristics of this grape are high saccharine strength and low acidity. Leaving out of this discussion the products from young vines in 1886, the sugar content has varied for the seasons of 1887, 1888, and 1889 from 26.31 to 32.01 per cent, and the proportion of acidity from .31 to .49 per cent.

The wine showed a high proportion of alcohol, this being from 12.54 to 15.50 per cent by volume, and a very light color, as also deficiency in tannin and acids, but a full or high body. On the whole, as to general quality, the wine has been poor or simply fair; the only measurably satisfactory sample was that obtained in 1887, which reminded one of a

"liqueur" wine, tending to the port character, but after having been some time in the bottle it showed no improvement, but went back to merely fair quality.

From the above it seems likely that the Ploussard in California is not likely to give other than poor or fair products; and as it is also a small bearer, it offers no inducements such as are held out by other varieties, which not only are good or heavy bearers, but are certain to yield products of good quality.

#### ALICANTE BOUSCHET.

This variety is one of the vines called Bouschet's hybrids; but this designation is not strictly correct, for the hybrids are properly those obtained from the sowing of a seed, the ovule having been fecundated by the pollen of another species, while in the Bouschet vines both parents belong to the *Vitus vinifera*. They are, therefore, the product of two distinct varieties of the same species, which impart a portion of their proper character for their descendants.

The Alicante Bouschet is at this time widely cultivated in southern France, on account of the good qualities of its wine, which is in every respect superior to that of the Petit Bouschet, the latter grape being only used for blending purposes because of its deep-colored juice. The Alicante Bouschet wine is of a remarkably strong red color, of good alcoholic strength, and rather agreeable.

This vine is the product of the Grenache, which yields but little color, and the Teinturier; it is a rather good bearer, but in order to maintain its productiveness it is necessary to give it short or half-long pruning, and plant it in rich soils; it matures early. There are six types of this variety.

#### ANALYSES OF WINES.

| ALICANTE BOUSCHET.                         | 1889.                                            | 1890.                              |                            |
|--------------------------------------------|--------------------------------------------------|------------------------------------|----------------------------|
|                                            | J. T. Doyle,<br>Experiment'l<br>Plot, Cupertino. | Margherita<br>Vineyard,<br>Fresno. | J. T. Doyle,<br>Cupertino. |
|                                            | No. 1199.                                        | No. 1241.                          | No. 1396.                  |
| <i>Must—</i>                               |                                                  |                                    |                            |
| Date of picking .....                      | Oct. 21                                          | Aug. 24                            | Oct. 18                    |
| Solid contents by spindle .....            | 22.80                                            | 22.15                              | 25.90                      |
| Sugar by copper test .....                 | 21.80                                            | 20.61                              | .....                      |
| Acid as tartaric .....                     | .44                                              | .44                                | 1.02                       |
| Ash .....                                  | .43                                              | .71                                | .....                      |
| <i>Wine—</i>                               |                                                  |                                    |                            |
| Alcohol { By weight .....                  | 9.12                                             | 9.05                               | .....                      |
| { By volume .....                          | 11.36                                            | 11.27                              | .....                      |
| Tannin .....                               | .295                                             | .214                               | .....                      |
| Total acid as tartaric { At pressing ..... | .48                                              | .....                              | .....                      |
| { At six to eight months .....             | .50                                              | .53                                | .....                      |
| Body .....                                 | 3.25                                             | 2.82                               | .....                      |

## COLOR READINGS.

| ALICANTE BOUSCHET.      | 1889.                   |               | 1890.                        |              |
|-------------------------|-------------------------|---------------|------------------------------|--------------|
|                         | J. T. Doyle, Cupertino. |               | Margherita Vineyard, Fresno. |              |
|                         | No. 1199.               |               | No. 1241.*                   |              |
| At pressing { Date..... | October 29.             |               | September 1.                 |              |
| { Color.....            | 114.3                   | V. R. 1 V. R. | 48.6                         | 3 V. R.      |
| One month.....          | 108.1                   | V. R. 1 V. R. | 25.0                         | 4 V. R.      |
| Two months.....         | 61.0                    | V. R. 1 V. R. | 25.7                         | 4-5 V. R.    |
| Three months.....       | 43.0                    | V. R. 1 V. R. | 19.3                         | 2 R.         |
| Four months.....        | 42.5                    | V. R. 1 V. R. | 14.6                         | 1-2 R.       |
| Five months.....        | 45.4                    | V. R. 1 V. R. | 13.1                         | 2 R.         |
| Seven months.....       | 38.8                    | 1 V. R.       |                              |              |
| Nine months.....        | 36.5                    | 2 V. R.       |                              |              |
| Ten months.....         |                         |               | 13.1                         | 3 V. R.+1 Y. |

\* This sample was blended with No. 1245, Petit Bouschet, from the same locality, and shows that these varieties lose their principal quality, the color, in the hot climate of Fresno.

*No. 1199. Alicante Bouschet.* From J. T. Doyle, Cupertino. Grapes arrived October 24, 1889, and were crushed the same day. Bunches average size, conical, shouldered, and loose; grapes over average in size and round; skin rather thick, but not tough; flesh soft and juicy; juice red colored and acid; stems medium strength; pedicels rather long; condition not good, much crushed; some berries moldy; maturity complete, juice showing 22.8 per cent of solid contents. Fermentation of 48.5 pounds crushed began October 26th, and reached its maximum of 79° on the following day. The murk was drawn off on October 29th, four days from crushing. The yield from the above amount was  $3\frac{1}{8}$  gallons, corresponding to 152.1 gallons per ton.

RECORD OF TREATMENT AND TASTING. 1889. *December 11.* Condition bright, with deep color, strong and pleasing bouquet, fairly agreeable flavor, full acid and astringency, good alcohol, body, and quality.

*December 13.* Racked and taken to the cellar.

1890. *February 6.* Lees sound.

*April 29.* Racked partly into bottles; wine clear and sound.

*May 15.* Lees show a very little acetic ferment.

*June 15.* Clear, rather coarse, and with a little too much acid, but well flavored and general quality good.

*August 4.* Lees show a few acetic and bitter ferments.

1891. *January 7.* Bright, deep color; good, but for a slight acetous taste.

*January 11.* Lees show a few lactic ferments.

*March 22.* Wine bottled April 29, 1890, sound but rough, and not clear. Wine in keg pasteurized and put in glass.

### Discussion of Results.

The Alicante Bouschet, so far as the record shows, has, at least at the Cupertino Experimental Plot, been a very good bearer. In the season of 1889, even from young vines, the crop was at the rate of over 10 tons per acre, this being a very large crop. But in the season of 1890, the vines being pruned long as in 1889, the crop fell to the rate of only 2.68 tons per acre. This fact should remind us that the Alicante Bouschet, while being an "extra fertile" variety, requires half-long, or, better, short pruning, to maintain its productiveness.

The saccharine strength for young vines was 21.80 per cent, and its

acidity .44 per cent, which, while being adequate for such a percentage of sugar, is not as high as reported by French viticulturists; however, in the season of 1890, a sample of the same grape from Cupertino contained 1.02 per cent of acid. The wine had 11.36 per cent of alcohol by volume, high astringency and body, and full acidity. Its color at pressing was as much as 114.3 per cent, with a purplish-red tint, and after five months it fell to 45.4 per cent with the same tint.

In general the wine has shown itself to be of rather good quality, but not a very good keeper; in the latter respect, however, we must consider that our only sample was that obtained from young vines.

#### PETIT BOUSCHET.

This grape is of especial interest as being the direct result of the careful crossing of the Aramon, a quantity grape of medium quality and yielding but little color, with the intensely colored Teinturier. Like the latter, it has not only color in the skin, but also in the juice itself, and is therefore largely used in making up for deficiency of color in blends, while it is not, by itself, a grape of high quality. It is a heavy bearer, even when short-pruned. It is cultivated chiefly in the south of France; ripens early. Leaves medium size, a little downy, rather deeply sinuate; bunches above average, or of large size, branched, shouldered, conico-cylindrical; berries medium or above medium size, spherical or spherico-ellipsoidal, bluish-black.

TABLE OF PRODUCTION.

| PETIT BOUSCHET.                                      | Number of Vines... | Total Weight of Grapes, in lbs.... | Average per Vine, in lbs..... | Date of Picking... |
|------------------------------------------------------|--------------------|------------------------------------|-------------------------------|--------------------|
| 1888—No. 944. J. T. Doyle, Cupertino .....           | 20                 | 405                                | 20.25                         | Oct. 25            |
| 1889—No. 1177. John Gallegos, Mission San José ..... | 19                 | 600                                | 31.57                         | Oct. 12            |

## ANALYSES OF WINES.

| PETIT BOUSCHET.  |                                |          |       |       |                  |                       |                            |           |           |        |                         |                        |               |      |     |
|------------------|--------------------------------|----------|-------|-------|------------------|-----------------------|----------------------------|-----------|-----------|--------|-------------------------|------------------------|---------------|------|-----|
| MUST.            |                                |          |       | WINE. |                  |                       |                            |           |           |        |                         |                        |               |      |     |
| Date of Picking. |                                |          |       | Ash   | Acid as Tartaric | Sugar by Copper Test. | Solid Contents by Spindle. | Alcohol.  |           | Tannin | Total Acid as Tartaric. |                        | Volatile Acid | Body | Ash |
|                  |                                |          |       |       |                  |                       |                            | By Weight | By Volume |        | At Pressing             | At Six to Eight Months |               |      |     |
| 1884—No. 242.    | Natoma Company, Natoma         | Sept. 19 | 20.61 | .36   |                  | 20.61                 |                            | 8.84      | 11.00     | .090   | .42                     | .58                    |               | 2.44 | .23 |
| 1886—No. 243.    | Natoma Company, Natoma         | Sept. 27 |       |       |                  |                       |                            | 9.27      | 11.55     | .120   | .50                     | .49                    |               | 2.87 | .37 |
| 1886—No. 620.    | C. C. Melver, Mission San José |          |       |       |                  |                       |                            | 9.92      | 12.36     | .260   | .76                     | .69                    |               | 3.80 | .31 |
| 1887—No. 725.    | J. P. Smith, Livermore         | Oct. 11  | 18.29 | .56   | 18.29            | 22.00                 | 22.67                      | 7.43      | 9.27      | .260   | .48                     | .50                    |               | 2.60 |     |
| 1888—No. 944.    | J. T. Doyle, Cupertino         | Oct. 25  | 22.00 | .66   | 22.00            | 22.67                 | 22.13                      | 8.27      | 10.36     | .370   | .71                     | .71                    |               | 3.10 |     |
| 1889—No. 1177.   | J. Gallegos, Mission San José  | Oct. 12  | 21.95 | .45   | 22.13            | 24.70                 | 25.76                      | 8.91      | 11.09     | .303   | .57                     | .56                    |               | 2.70 |     |
| 1890—No. 1245.   | Margherita Vineyard, Fresno*   | Aug. 24  | 24.70 | .51   | 25.76            |                       |                            |           |           |        |                         |                        |               |      |     |
| 1890—No. 1378.   | J. Gallegos, Mission San José  | Oct. 19  | 23.50 | .80   | 23.50            |                       |                            | 9.12      | 11.36     | .485   | .83                     | .37                    |               | 3.32 |     |
| 1894—No. 1394.   | J. T. Doyle, Cupertino         | Oct. 19  | 23.70 | .69   |                  |                       |                            |           |           |        | No                      | wine.                  |               |      | }   |

\*The wine of No. 1245 was blended with No. 1241.

## COLOR READINGS.

|                          | 1886.                              | 1887.                      | 1888.                                            | 1889.                                                  |
|--------------------------|------------------------------------|----------------------------|--------------------------------------------------|--------------------------------------------------------|
| PETIT BOUSCHET.          | C. C. McIver,<br>Mission San José. | J. P. Smith,<br>Livermore. | J. T. Doyle,<br>Experimental<br>Plot, Cupertino. | J. Gallegos,<br>Experim'tal Plot,<br>Mission San José. |
|                          | No. 620.*                          | No. 725.                   | No. 944.                                         | No. 1177.                                              |
| Must .....               |                                    | 13.5 4 R.                  | 38.1 R.                                          |                                                        |
| At pressing { Date ..... | October.                           | Oct. 19.                   | Oct. 30.                                         | Oct. 19.                                               |
| { Color .....            |                                    | 44.4 3 V. R.               | 190.5 2 V. R.                                    | 153.8 1 V. R.                                          |
| One month .....          |                                    |                            | 114.3 2 V. R.                                    | 111.1 1-2 V. R.                                        |
| Two months .....         |                                    | 14.2 2 R.                  | 85.1 1-2 V. R.                                   |                                                        |
| Three months .....       |                                    |                            | 66.6 2 V. R.                                     | 58.8 1 V. R.                                           |
| Four months .....        |                                    | 9.5 2 R.                   | 66.6 2 V. R.                                     | 58.8 1 V. R.                                           |
| Five months .....        | 154.0 1-2 V. R.                    |                            |                                                  | 58.8 1 V. R.                                           |
| Six months .....         |                                    |                            |                                                  | 58.8 1 V. R.                                           |
| Seven months .....       | 129.0 2 V. R.                      | 8.3 2 R.                   |                                                  |                                                        |
| Eight months .....       |                                    |                            | 66.6 1 V. R.                                     |                                                        |

\* Wine received for examination.

*No. 725. Petit Bouschet.* From J. P. Smith, Livermore. The grapes arrived October 13, 1887, and were crushed same day. Their condition was good but very uneven; some bunches ripe, and with flabby and half-dried berries; others not fully ripe, quite sour, and with little color; stems, however, drying up, and showing by their knottiness and the sparseness of bunches a good deal of early coulure; pedicels largely entirely dropped off; shape of bunches triangular when large. Berries undersize, only a few reaching that of the figure in the "Vignobles," or of the former sample from Natoma. The juice showed 18.82 per cent of solid contents. Fermentation of 97.50 pounds crushed began on the evening of October 13th, and reached its maximum of 79° on the 16th, fermentation having been very violent. It was drawn off on October 19th, six days from crushing, yielding 7 $\frac{1}{2}$  gallons, or at the rate of 160 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. December 13. Condition slightly turbid; wine still fermenting, and promises to be flat and thin.

1888. January 30. Racked and pasteurized the wine for safety.

February 8. A slightly turbid, bitterish-tasting wine, decidedly milk-sour; quality poor.

May 5. Bouquet fairly developed, but wine is thin and flat.

June 12. The sediment still shows lactic ferments and effete yeast. The quality being very poor, owing doubtless to the youth of the vines, the sample was discarded.

*No. 944. Petit Bouschet.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived and were worked on October 26, 1888; condition fair; nearly every bunch had dried grapes, some wilted; stems thick; color of juice characteristic red; it showed 22 per cent of solid contents. Fermentation of 114.5 pounds crushed began on October 27th, and reached its maximum of 91° the following afternoon. On October 30th the murk was drawn off, four days from crushing, yielding from the above amount 7 $\frac{1}{2}$  gallons, or at the rate of 128.8 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. November 28. Taken to cellar.

December 14. Wine clear and bouquet undeveloped; taste rough; lees sound.

1889. March 14. Lees show some filiform ferment; pasteurized the wine.

May 29. Racked again; taste not good.

August 9. A passable wine of no very marked character, except color.

1890. February 11. Lees show considerable amount of bitter and lactic ferments.

February 18. Racked.

July 20. Wine rapidly deteriorating and discarded.

*No. 1177. Petit Bouschet.* From J. Gallegos, Mission San José. Grapes received October 16, 1889, in fair condition and were crushed the same day. Bunches over average size, pyramidal, shouldered, solid, but not compressed. Grapes medium size, and round; skin rather thick; flesh soft; not juicy; juice very dark red. The juice showed 21.95 per cent of solid contents. Fermentation started October 17th, and reached its maximum on the following day; the fermentation was very violent. On October 19th, three and one half days from crushing, the murk was drawn off, being nearly dry. From 111.5 pounds crushed, 9.37 gallons was obtained, corresponding to 168.16 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1889.** *December 9.* Condition bright, with very dark color, undeveloped bouquet, agreeable but not marked flavor, smooth taste, medium acid and alcohol, full astringency and body; quality good.

*December 13.* Racked and taken to cellar.

*1890. January 24.* A bright and developing wine, but not much changed since last tasting. Lees show a very little lactic ferment.

*May 29.* Nearly clear; a slight lactic taste perceptible; pasteurized.

*June 13.* Good vinous bouquet; lactic taste almost gone.

*July 31.* Lees show incrustated filiform ferment.

*August 19.* In good condition; racked. The wine bottled May 29th is spoiled.

*1891. January 2.* A bright, smooth, pleasing, but neutral wine; a little exhausted.

*March 17.* Wine bottled April 19, 1890, bright and of fair quality, but not equal to keg sample. Wine in keg was racked and some bottled.

*June 6.* Lees show much "*pastorianus*" ferment.

*August 26.* Wine in keg bottled.

### *Discussion of Results.*

From the above record it appears that the Petit Bouschet at the Cupertino Experimental Plot has shown itself to be an exceedingly heavy bearer; in fact the crops gathered in the seasons of 1888 and 1889 were respectively at the rate of about 6.8 and 10.5 tons per acre. However, it has matured much later than is reported in French practice.

The *saccharine strength* of this grape reached the maximum amount, 22.67 per cent, in 1888, and in general was higher in sugar than that of the Alicante Bouschet, which also, however, represented young vines; a lower percentage of sugar was observed in the seasons of 1884 and 1886 in grapes from Natoma and Livermore, in which it was respectively 20.61 and 18.29 per cent. Its acidity varied from .45 to .66 per cent.

This variety can produce a wine of more than 12 per cent of *alcohol* by volume, as is shown by the analysis of a sample of wine sent to the laboratory by Mr. C. C. McIver, of Mission San José; but in the experimental vinification at the University we have noted for the good samples of grapes, a percentage of alcohol varying from 10.36 to 11.55.

As to *tannin*, except that from Natoma grapes in 1884, the Petit Bouschet wine may be considered more astringent than the Alicante Bouschet; the same can be said in regard to the acidity, while it has less body than the latter, excepting the case of McIver's wine, which had a heavier body.

As to *color*, except for the unripe grapes of 1887 from Livermore, this variety was much more deeply colored than the Alicante Bouschet, the rate being at pressing from 153.8 to 190 per cent, with "first to second purplish-red" tint; this after three months fell to 58.8 and 66.6 per cent and remained stable at that point and with a "first purplish-red" tint. McIver's wine examined at five and seven months from pressing showed a very high color, 154 and 129 per cent with "second purplish-red" tint.

On the whole the wine is only of fair quality, and a poor keeper; the

grape should only be used for blending with others lacking in color, while in other respects there is no improvement to be gained, the wine being decidedly coarse in flavor.

## 5. AUSTRIAN AND HUNGARIAN TYPE.

The Austro-Hungarian empire produces wines as diverse as its people. Some are so deeply colored and so heavy bodied that, being diluted with an equal proportion of water, they still retain a good color, alcoholic strength, and body; some others, on the contrary, are so very harsh as to produce a disagreeable sensation on the tongue. We find, also, very sweet and aromatic wines, while others are very coarse. Finally, some others are light, but possess the delicacy, though not the bouquet, of the wines of the Rhenish region.

The varieties which produce the best red wines in the empire are the Refosco and Marzemino of Italy, the Lagrain, the Kadarkas, the Blaue Portugieser, and even the Grossblau; according to later reports the Bordeaux and the Burgundy varieties are cultivated in the Istrian region with rather good success. The California Zinfandel, considered of Hungarian origin, is unknown by that name in that country, but whatever its true name may be, it has been fully demonstrated that it is not nearly as valuable a wine grape for this State as has been supposed; and in case it should be supplanted with varieties of this type, some of the above mentioned should be used. The Refosco, the Lagrain, the Portugieser, and the Kadarkas are in many respects superior to the Zinfandel.

### ZINFANDEL.

The Zinfandel is too well known in California to require any description or special discussion of its qualities. The chemical characteristics of its wine have been adequately illustrated in our former reports; hence, it is only material from new localities, or new methods of treatment, that should engage our attention, and such is the case with the samples herein discussed.

It is pretty well understood and agreed at this time that the great predominance of this grape in our wine product is not altogether as desirable as it was once thought to be; partly because it never rises above fair quality, and the special flavor of the grape is not acceptable to a large number of consumers who are accustomed to the neutral clarets of France; partly also because its thin skin renders it very liable to sunburn, as well as damage from early rains; so that grapes unsound in one or the other way but too often find their way into the vat, and thus greatly damage not only the *drinking*, but also, and very materially, the *keeping* qualities of the wine. Had California adopted from the outset grape varieties less liable to such injuries, the set-backs repeatedly received by our wines in the market, for lack of keeping qualities, would doubtless have been materially less severe; for with the Zinfandel grape only the greatest care in manufacture can insure the absence of unsound grapes in the fermenting tanks. It is not, therefore, without good cause that its popularity is decreasing, and that sturdier, and on the whole, higher grade varieties are gradually taking its place in the planting of new vineyards. Still, its numerical predominance renders it, at this time, the most important wine grape in the State.



## ANALYSES OF WINES.

|            | ZINFANDEL.                                                                  | Date of Picking..... | MUST.                          |                        |                       | WINE.     |                 |                 |             |
|------------|-----------------------------------------------------------------------------|----------------------|--------------------------------|------------------------|-----------------------|-----------|-----------------|-----------------|-------------|
|            |                                                                             |                      | Solid Contents by Spindle..... | Sugar by Copper Test.. | Acid as Tartaric..... | Ash ..... | Alcohol.        |                 | Tannin..... |
|            |                                                                             |                      |                                |                        |                       |           | By Weight ..... | By Volume ..... |             |
| 1887—      |                                                                             |                      |                                |                        |                       |           |                 |                 |             |
| No. 801.   | Condensed Must Company, Geyersville †                                       | Sept. 27             | 24.20                          | 24.02                  | 39                    | 36        | 10.54           | 13.00           | 259         |
| No. 691.   | J. Gallegos, Mission San José                                               | Sept. 27             | 22.96                          | 22.67                  | 39                    | 46        | 9.34            | 11.65           | 197         |
| No. 789.   | J. Gallegos, Mission San José (third crop)                                  | Nov. 11              | 20.85                          | 20.24                  | 30                    | 30        | 8.48            | 10.58           | 144         |
| No. 800.   | J. Gallegos, Mission San José †                                             | Nov. 11              | 20.85                          | 20.24                  | 30                    | 30        | 7.78            | 9.73            | 200         |
| No. 737.   | J. Bergin, Mountain View                                                    | Oct. 11              | 25.75                          | 25.19                  | 58                    | 46        | 9.70            | 12.09           | 174         |
| No. 693.   | R. Wegener, Livermore                                                       | Sept. 19             | 26.50                          | 26.99                  | 65                    | 37        | 10.81           | 13.27           | 224         |
| No. 687.   | J. P. Smith, Livermore                                                      | Sept. 23             | 23.20                          | 22.67                  | 74                    | 34        | 9.34            | 11.65           | 171         |
| No. 679.   | Margherita Vineyard, Fresno (first crop)                                    | Aug. 23              | 23.59                          | 24.64                  | 64                    | 40        | 9.20            | 11.45           | 228         |
| No. 717.   | Margherita Vineyard, Fresno (second crop)                                   | Oct. 9               | 28.34                          | 29.52                  | 39                    | 45        | 9.92            | 12.36           | 350         |
| No. 808.   | Pure California Zinfandel, bought in Boston, sent by Cordelia Wine Company* |                      |                                |                        |                       |           |                 |                 |             |
| 1888—      |                                                                             |                      |                                |                        |                       |           |                 |                 |             |
| No. 851.   | A. Caminetti, Jackson, Amador Co. (first crop)                              | Sept. 15             | 24.31                          | 24.64                  | 36                    | 26        | 10.81           | 13.27           | 240         |
| No. 852.   | A. Caminetti, Jackson, Amador Co. (second crop)                             | Sept. 15             | 22.98                          | 23.62                  | 36                    | 28        | 9.86            | 12.27           | 156         |
| No. 857.   | J. Gallegos, Mission San José                                               | Sept. 21             | 21.59                          | 21.80                  | 48                    | 38        | 7.78            | 9.73            | 144         |
| No. 923.   | Margherita Vineyard, Fresno (second crop)                                   | Oct. 17              | 26.00                          | 26.48                  | 38                    | 42        | 10.44           | 12.91           | 240         |
| No. 1071.  | A. Caminetti, Jackson, Amador Co.                                           | Sept. 13             | 25.67                          | 25.78                  | 41                    | 39        | 11.62           | 14.20           | 345         |
| No. 1038.  | Margherita Vineyard, Fresno (first crop)                                    | Sept. 18             | 32.20                          | 31.60                  | 39                    | 50        | 11.62           | 14.20           | 345         |
| No. 1088a. | Margherita Vineyard, Fresno (second crop)                                   | Sept. 18             | 32.20                          | 31.60                  | 39                    | 50        | 11.62           | 14.20           | 345         |
| No. 1089a. | Margherita Vineyard, Fresno (second crop)                                   | Sept. 18             | 27.45                          | 27.65                  | 62                    | 39        | 11.62           | 14.20           | 345         |
| No. 1257.  | Pine Grove, Ione                                                            | Sept. 23             | 22.60                          | —                      | 55                    | 27        | 10.35           | 12.82           | 241         |

\* Wines sent for examination. † Same as No. 799, but fermented at 92° to 95° F. ‡ Diluted with water to that density. § Fortified.

## COLOR READINGS.

| ZINFANDEL.               | 1887.                          |                                     |                                |                            |                           |                        |                         |
|--------------------------|--------------------------------|-------------------------------------|--------------------------------|----------------------------|---------------------------|------------------------|-------------------------|
|                          | J. Gallegos, Mission San José. | Condensed Must Comp'y, Geyserville. | J. Gallegos, Mission San José. |                            | J. Bergin, Mountain View. | R. Wegener, Livermore. | J. P. Smith, Livermore. |
|                          | No. 691.                       | No. 801.                            | No. 799.<br>(Third crop.)      | No. 800.†<br>(Third crop.) | No. 787.                  | No. 686.               | No. 687.                |
| At pressing { Date ----- | Oct. 6.                        | Nov. 22.                            | Nov. 18.                       | Nov. 17.                   | Oct. 22.                  | Oct. 1.                | Oct. 1.                 |
| Color -----              | 49.9 2 V. R.                   | 13.5 5 V. R.                        | 50.9 1 V. R.                   | 51.0 2 V. R.               | 40.0 2 V. R.              | 40.0 2 V. R.           | 29.0 2 V. R.            |
| One month -----          | 29.9 2 V. R.                   | 11.1 2 R.                           | 30.7 1-2 V. R.                 | 34.8 2 V. R.               | 20.0 3 V. R.              | 17.4 1 R.              | 16.9 3 V. R.            |
| Two months -----         | 18.6 4 V. R.                   | 10.6 2 R.                           | 26.0 2 V. R.                   | 15.4 5 V. R.               | 17.4 R.                   | 17.0 1 R.              | 10.7 5 V. R.            |
| Three months -----       |                                |                                     |                                |                            |                           |                        |                         |
| Four months -----        |                                |                                     |                                |                            |                           |                        |                         |
| Five months -----        |                                |                                     |                                |                            |                           |                        |                         |
| Six months -----         |                                |                                     |                                |                            |                           |                        |                         |
| Seven months -----       | 13.3 1 R.                      | 8.3 3 R.                            | 10.5 1 R.                      | 20.5 4 V. R.               | 11.5 1 R.                 | 12.9 O. R.             | 7.1 3 R.                |
| Eight months -----       |                                |                                     |                                |                            |                           |                        |                         |

† Same as No. 799, but fermented at 90° to 95° F.

## COLOR READINGS—Continued.

| ZINFANDEL.              | 1887.                        |                            |                                            |       | 1888.                                 |                            |
|-------------------------|------------------------------|----------------------------|--------------------------------------------|-------|---------------------------------------|----------------------------|
|                         | Margherita Vineyard, Fresno. |                            | Cordelia Wine Comp'y, Boston. <sup>†</sup> |       | A. Caminetti, Jackson, Amador County. |                            |
|                         | No. 679.<br>(First crop.)    | No. 717.<br>(Second crop.) | No. 808.*                                  |       | No. 851.<br>(First crop.)             | No. 852.<br>(Second crop.) |
| At pressing { Date..... | Sept. 2.                     | Oct. 29.                   |                                            |       | Sept. 24.                             | Sept. 25.                  |
| One month { Color.....  | 30.7 3 V. R.                 | 23.9 5 V. R.               |                                            |       | 16.6 4 V. R.                          | 14.3 4 V. R.               |
| Two months.....         |                              |                            |                                            |       | 8.2 1 R.                              | 11.1 3 R.                  |
| Three months.....       | 10.7 1 R.                    | 22.2 4-5 V. R.             | 8.8                                        | O. R. | 8.4 3 R.                              | 9.8 1 R.                   |
| Four months.....        |                              | 8.3 4 R.                   |                                            |       | 8.7 3 V. R. + 1 Y.                    | 8.1 2 V. R. + 1 Y.         |
| Five months.....        | 9.3 R.                       |                            |                                            |       | 8.0 4 V. R. + 1 Y.                    | 8.1 3 V. R. + 1 Y.         |
| Six months.....         |                              |                            |                                            |       |                                       |                            |
| Seven months.....       |                              | 8.0 O. R.                  |                                            |       |                                       |                            |
| Eight months.....       | 8.7 2-3 R.                   |                            |                                            |       |                                       |                            |

\* Wine sent for examination. † Pure California Zinfandel, bought in Boston and sent by the Cordelia Wine Company.

## COLOR READINGS—Continued.

| ZINFANDEL.         | 1888.                                |                                   |                                             | 1889.                              |                                    |  |
|--------------------|--------------------------------------|-----------------------------------|---------------------------------------------|------------------------------------|------------------------------------|--|
|                    | J. Gallegos,<br>Mission San<br>José. | Margherita Vine-<br>yard, Fresno. | A. Caminetti,<br>Jackson, Amador<br>County. | Margherita<br>Vineyard,<br>Fresno. | Margherita<br>Vineyard,<br>Fresno. |  |
|                    | No. 857.                             | No. 923.<br>(Second crop.)        | No. 1071.                                   | No. 1098.<br>(First crop.)         | No. 1099.<br>(Second crop.)        |  |
| At pressing { Date | Sept. 29.                            | Nov. 1.                           | Sept. 24.                                   | Oct. 1.                            | Sept. 28.                          |  |
| One month { Color  | 25.1 4 V. R.                         | 28.6 4 V. R.                      | 20.9 1 R.                                   | 20.9 1 R.—R.                       | 32.8 4 V. R.                       |  |
| Two months         | 21.6 4 V. R.                         | 24.2 4 V. R.                      | 12.5 1 R.—R.                                | 14.5 3 R.                          | 20.0 1-2 R.                        |  |
| Three months       | 21.0 4-5 V. R.                       | 21.0 4-5 V. R.                    | 10.1 2 V. R.—1 Y.                           | Port.                              | 18.4 3 R.                          |  |
| Four months        | 19.5 4-5 V. R.                       | 18.6 4 V. R.                      | 10.0 3 V. R.—1 Y.                           | Port.                              | Port.                              |  |
| Five months        | 13.7 4-5 V. R.                       | 20.0 5 V. R.                      | 9.8 3 V. R.—1 Y.                            | Port.                              | Port.                              |  |
| Six months         |                                      |                                   | 9.7 4 V. R.—1 Y.                            | Port.                              | Port.                              |  |
| Seven months       |                                      |                                   |                                             | Port.                              | Port.                              |  |
| Eight months       |                                      |                                   |                                             | Port.                              | Port.                              |  |

*No. 686. Zinfandel.* From R. Wegener, Livermore. The grapes arrived September 22d, and were crushed the same day. Their condition was fair. The juice showed 26.50 per cent of solid contents. Fermentation of 98 pounds crushed began on the evening of September 22d, and reached its maximum of 85° on the 26th, when it became very violent. It was drawn off October 1st, ten days from crushing. The yield from the above amount was 6½ gallons, or at the rate of 130 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 6.* Racked the wine.

*December 19.* Condition clear, with light acid and astringency; a heavy body; pleasant, sound, and clean-tasted wine.

1888. *February 9.* Bouquet very characteristically "Zinfandel;" a medium body; altogether a good, pleasant, clean wine.

*May 28.* The microscope shows in the sediment traces of lactic germs. Racked and pasteurized the wine.

*June 26.* Condition bright, bouquet very characteristic, and acid somewhat sharpish.

1889. *November 4.* Condition bright, with good color, faint bouquet, clean taste, and vinosity well developed; medium body, acid, and alcohol; quality good.

*No. 687. Zinfandel.* From J. P. Smith, Livermore. The grapes arrived on September 26th, and were worked the same day. Their condition was good. Bunches large and unusually branched and shouldered; somewhat loose from about 10 per cent early coulure. The juice showed 23.20 per cent of solid contents. Fermentation of 71 pounds crushed began on the forenoon of September 27th, and reached its maximum of 80° on the following day, during which time it was very violent. On October 1st, five days from crushing, it was drawn off. The yield from the above amount was 5½ gallons, or at the rate of 148 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 19.* Condition clear, with a not very characteristic bouquet, a moderate acid, about .14 per cent of astringency, and medium body. A sound wine, very different from Wegener's, No. 686.

1888. *January 19.* The wine was racked.

*February 16.* Condition bright, with very pronounced raspberry bouquet, heavy body, pleasant, and about .55 per cent acid. As a whole, the wine is well developed and agreeable for its age.

*May 12.* The sediment shows traces of acetic germs and some amorphous matter. Racked and pasteurized the wine.

*June 26.* Condition bright; well-developed raspberry flavor; acid hardly indicates 6 pro mille.

*No. 679. Zinfandel (first crop).* From Margherita Vineyard, Fresno. The grapes arrived August 26, 1887, and were crushed the same day. Their condition was good. Berries somewhat uneven in their degree of ripeness, some being very sweet and half dried, some almost green, yet fairly sweet; color in general very light, skins very thin; berries on the whole very large. The juice showed 23.59 per cent of solid contents. Fermentation of 80.5 pounds crushed began on August 27th, and reached its maximum of 78° on the 30th. On September 2d, seven days from crushing, it was drawn off. The yield of the above amount was 6½ gallons, or at the rate of 162 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 3.* The young wine was racked from the lees.

*December 19.* A bright wine, with a characteristic flavor, and a pleasant, medium acid taste, but as a whole, thin and poor.

1888. *February 16.* Condition bright, with bouquet well developed; improved in general quality since the last tasting, but still somewhat thin; a drinkable wine.

*May 12.* Racked and pasteurized the wine for safety.

*June 16.* Condition bright, with well-developed bouquet, vinous odor, and pleasant, but sharpish acid.

*No. 691. Zinfandel (first crop).* From John Gallegos, Mission San José. Grapes arrived September 30, 1887, and were crushed the next day. Their condition was good, showing considerable early coulure; bunches somewhat loose, and with berries of unequal size; coulure on an average of 25 or 30 per cent, in the lot. The juice showed 22.96 per cent of solid contents. Fermentation of 217 pounds crushed began on the afternoon of October 1st, and reached its maximum of 93° on the 3d, and remained in violent action for three days. On October 6th, five days from crushing, it was drawn off. The yield from the above amount was 16½ gallons, or at the rate of 155 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 19.* Condition clear; a very characteristic, clean-tasted wine of good body and alcohol.

1888. *January 19.* Racked the young wine.

*February 9.* Condition bright, with light acid, medium body, and astringency from .12 to .15 per cent; a sound, pleasant, light wine.

*June 2.* Condition bright, with well-developed bouquet; thin body; slightly tainted with acetic ferment.

A microscopic examination of the sediment shows effete yeast and traces of acetic and lactic ferments. Racked and pasteurized.

*No. 717. Zinfandel (second crop).* From Margherita Vineyard, Fresno. Their condition was excellent; berries large and full, very sweet; bunches of the "second crop" type small and short, rather loose; almost no coulure. Looked quite unlike any ordinary Zinfandel, and the berries were quite twice the size of any second-crop Zinfandel of the north; the stems were somewhat dry. The juice showed 28.34 per cent of solid contents. Fermentation of 120.75 pounds crushed began very feebly on October 13th, the day after their crushing, and continued in this state until the 16th; on the 17th the temperature was raised from 75° to 85° by stirring vigorously with a can filled with hot water; it then continued briskly until October 19th, when it again subsided to 74°; it was again elevated to 86° by the hot-water can. On October 20th it was aerated ten minutes, then stirred with hot water until 82° was attained. On October 21st, the temperature was again elevated to 83°. This action was again repeated on the 24th, elevating the temperature to 85°. On October 25th, the murk was tested by spindle, and found to contain 10 per cent of solid contents. As it was apparent that it would not "go through," there were added 1.50 gallons of distilled water, previously heated to 85°, so as to reduce the original sugar from 28.34 to 25 per cent. It then continued moderate in action until October 29th, when it fell to 75°, and the murk was drawn off, eighteen days from crushing. The yield from the above amount, deducting the water added, was 10⅛ gallons, or at the rate of 167 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 13.* Condition excellent, and wine well advanced.

1888. *January 26.* Racked and pasteurized the wine, as it tasted acetified.

*February 8.* Slightly acetified and rather empty tasting, with an unpleasant, prominent astringency, and little else to make a wine of it—would not be recognized as Zinfandel.

*June 20.* Condition bright, with unpleasant bouquet and odor, bitterish and "puckery" astringency; after-taste greasy, and indicates lactic taint. The microscope shows in the sediment effete yeast and traces of lactic ferment.

A tasting made on November 4, 1889, of this sample showed a bright and good bodied and colored wine, but having only slight bouquet and an abnormal taste. It was fairly acid, rather alcoholic, and highly astringent, but as a whole, was of fair quality.

[For detailed discussion of No. 717, as well as for No. 799 and others, the reader is referred to page 20 and following under the head of "The Zinfandel Fermentations" in the "Report of Experiments on Methods of Fermentation," that can be had on application.]

**No. 737. Zinfandel.** From J. Bergin, Mountain View. The grapes arrived October 14th, and were crushed the following day. Their condition was good; bunches quite large and long; little coulure; berries full-size, thin-skinned, and very sweet. The juice showed 25.75 per cent of solid contents. Fermentation of 35.50 pounds crushed began on October 16th, and reached its maximum of 80° on the evening of the 18th. On October 22d, seven days from crushing, the murk was drawn off. The yield from the above amount was 3½ gallons, or at the rate of 203 gallons per ton; this being the largest yield per ton observed in 1887.

**RECORD OF TREATMENT AND TASTING.—1887. December 6.** Racked the wine from the lees.

**December 20.** Condition clear and characteristic and well-developed bouquet; moderate and pleasant acid; rather light body. The wine is a little green, but good in other respects. The grapes were from young vines.

**1888. February 9.** Condition bright, with well-developed bouquet; quite low astringency; pleasant acid. A soft, pleasant, and well-developed wine.

**June 21.** Condition bright, with well-developed bouquet; marked astringency; medium acid; an after-taste of lactic acid.

A microscopical examination of the sediment shows an abundance of lactic and a small amount of acetic germs. Racked and pasteurized.

**No. 799. Zinfandel (third crop).** From John Gallegos, Mission San José. The grapes arrived November 14th, and were worked the following day. Their condition was good, nearly ripe, and quite even; berries good size, juicy; very few imperfect or dried; bunches very loose, in part from coulure; berries quite sweet, evidently with very little acid. The juice showed 20.85 per cent of solid contents. The grapes were divided into two equal lots. The fermentation of the first lot, consisting of 57 pounds, commenced on November 16th; continued very violently, frothing a great deal until the following day, when it reached its maximum of 83°. On November 18th it was drawn off, having finished its fermentation in seventy hours. The yield from the above amount was 4½ gallons, or at the rate of 174 gallons per ton.

**RECORD OF TREATMENT AND TASTING.—1887. November 30.** The wine was racked from the lees.

**December 26.** A microscopical examination of the sediment shows plenty of yeast, both living and dead.

**1888. January 16.** Racked again.

**February 16.** Condition bright, with very characteristic Zinfandel bouquet, tastes slightly bitter and somewhat harsh; acid medium; a rather light wine, needs blending to make it satisfactory.

**May 8.** Condition bright; wine pleasant but not advanced in development; a fair table claret as it stands.

**June 5.** The microscope shows traces of lactic ferment in the sediment. Racked and pasteurized for safety.

**June 14.** A well-developed wine with a decided Zinfandel bouquet.

**1889. November.** Condition bright, with color rather light, bouquet not strong, and flavor not very agreeable; taste developed; medium body and alcohol; high acid; quality fair.

**No. 851. Zinfandel.** From A. Caminetti, Jackson, Amador County. Grapes arrived and were worked on September 18th; condition, ripe; stems almost entirely dry and many dried berries; apparently neither coulure nor sunburn; bunches of characteristic shape, on the whole rather small but very compact; very sweet, should have been picked

sooner apparently. Juice showed 24.31 per cent of solid contents. Fermentation of 63 pounds crushed began on September 19th, and reached its maximum of 81° on the 21st. The murk was drawn off six days from crushing. The yield from the above amount was 5½ gallons, corresponding to 167 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *October 29.* Action ceased, but wine not clear enough to be racked; put in cellar.

*December 15.* Condition clear, with bouquet undeveloped; high acid, medium astringency, alcohol, and body; lees show traces of lactic germs; racked and pasteurized the wine.

1889. *February 27.* The sediment shows effete yeast and dead lactic filaments; racked the wine again.

*August 3.* Condition bright, with light color, agreeable bouquet, neutral but pleasant flavor, smooth taste, light body, medium acid, low astringency, and full alcoholic strength; stands a little dilution.

1890. *February 6.* Lees sound.

*February 13.* Condition bright; wine developed and ready to bottle; quality alcoholic and rather coarse, but not unpleasant.

*March 7.* Racked, and part bottled.

*July 18.* Lees sound.

*July 24.* Still clean tasting, and of fair quality.

*August 11.* Bottled.

1891. *February 11.* Wine bottled August 11, 1890, bright, no deposit, sound, a little bouquet, and some flavor; of fair quality.

No. 852. *Zinfandel* (second crop). From A. Caminetti, Jackson, Amador County. Grapes arrived and were crushed on September 18th; condition only fair, stems all dry, bunches loose and scraggly; berries undersized and unevenly ripe, otherwise resembling the Fresno second crop. Juice showed 22.98 per cent of solid contents. Fermentation of 54.5 pounds crushed began on September 19th, and reached its maximum temperature of 80.5° on the 22d. On September 25th, seven days from crushing, the murk was drawn off. The yield from the above amount was 4½ gallons, or at the rate of 174.3 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 15.* Condition clear, and undeveloped bouquet; sharpish, but not high acid; astringency fair; high alcohol, and medium body; lees show traces of both lactic and acetic germs; racked and pasteurized.

1889. *February 28.* Racked again; lees show a few dead lactic germs.

*August 19.* Condition bright, with a light color, and bouquet and flavor more marked than the first crop (No. 851); a clean taste, medium body and astringency; full acid and alcohol; of good quality; stands a little water upon dilution.

1890. *February 9.* Lees contain an abundance of lactic germs.

*February 13.* Condition clear; after-taste strongly of lactic taint.

*March 6.* (1-gallon demijohn.) No lactic taste.

*March 7.* Racked.

*July 18.* Wine deteriorated, and therefore discarded.

No. 857. *Zinfandel*. From J. Gallegos, Mission San José. Grapes arrived on September 24, 1888, and were crushed the following day. The sample was in poor condition; a few dried berries and some crushed. The juice showed 21.59 per cent of solid contents. Fermentation of 34 pounds crushed began September 26th, and reached its maximum temperature of 83° on the next day. On September 29th, four days from crushing, the murk was drawn off. The yield from the above amount was 2½ gallons, corresponding to 154.4 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *November 2.* Taken to cellar.

*December 11.* Rough taste, sharp acid, and quite good astringency. The sediment shows under the microscope lactic germs. Racked and pasteurized.

1889. *June 1.* Racked again.

*August 19.* Condition bright, with a good red color, undeveloped bouquet, flat flavor, acetic acid taste, medium body and alcohol, full acid, and low astringency; quality fair, on dilution, holds out fair. (Sample in glass.)

*November 4.* Same remarks as at previous tasting of August 19th.



1890. *February 28.* Condition bright, with undeveloped bouquet; full and agreeable acid; general quality rather good, but for suspicion of lactic taint. Racked.

1891. *February 11.* Bright, little changed; a fair wine, with some bouquet and full flavor.

*No. 923. Zinfandel* (second crop). From Margherita Vineyard, Fresno. Grapes arrived in good condition on October 20, 1888, and were worked the next day. For second crop the berries are very large and sweet, characteristic of the locality; stems only just commencing to dry, which may be accounted for by the north wind; not overripe, but many bunches have raisins. A little coulure, both early and late. The juice showed 26 per cent of solid contents. After the crushing of 146½ pounds, the lot was divided into two portions. The first, No. 923, was fermented at 90° to 95° in hot chamber; the other, No. 923a, was fermented in the ordinary way, *i. e.*, temperature 75°. The yield from the above amount was 11½ gallons, corresponding to 162.1 gallons per ton.

*No. 923.* Fermentation of this portion began at its maximum temperature of 89° (room, 95°) on October 23d, continued at this point for 48 hours, when it ceased violent action, the temperature gradually falling to 82° (room, 91°) on October 31st; the next day, or eight days from crushing, the murk was drawn off.

*No. 923a.* Fermentation began October 23d, and reached the maximum of 84° on the 25th. On the 27th it "struck" for 72 hours and was placed in the hot-box (temperature, 90°), and fermented at a temperature of 81° till November 1st, or eight days from crushing, when it was drawn off.

RECORD OF TREATMENT AND TASTING.—1888. *December 3.* Taken to cellar.

*December 17.* Wine very clear, with a dry taste, well-developed bouquet, high body and alcohol, and full acid and astringency.

1889. *November 26.* Lees show small quantities of lactic ferment; racked and pasteurized.

*May 20.* Racked; condition clear.

*August 19.* Condition bright, with a good red color, a diminished bouquet, vinous flavor, clean taste, light body, medium acid, full astringency and alcohol; its quality is rather good; wine stands dilution well.

*November 4.* (In glass.) Better bouquet, and apparently has more astringency than sample in keg.

1890. *February 17.* Condition bright, with marked bouquet and flavor; general quality rather coarse, but wine sound and good.

*March 3.* Racked.

*July 17.* Lees sound.

*July 23.* Bright, sound, and full-flavored, but coarse and rough.

*August 12.* Bottled.

1891. *March 2.* Wine bottled May 20, 1889, clear, heavy deposit, flat, harsh, and generally inferior; evidently bottled too soon. Wine bottled March 10, 1890, bright, no deposit, rough, but with bouquet and vinous flavor; quality good. Wine bottled August 12, 1890, smoother than the last, but with less bouquet; indicating that it was injured by remaining too long in the small wooden package.

*No. 1071. Zinfandel.* From A. Caminetti, Jackson, Amador County. Bunches of good size and rather close; condition very good; maturity complete, some dried grapes on most of the bunches. The 210 pounds were received September 16, 1889, and were crushed the following day. Juice showed 25.67 per cent of solid contents. Fermentation commenced on the evening of September 18th, and reached its maximum of 91.5° on the 21st. On September 24th, seven days from crushing, the murk was drawn off, being still sweet. From the above amount 16.63 gallons were obtained, corresponding to 158 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 25.* Condition clear, with a light red color, a marked bouquet, characteristic flavor, clean taste, good body, medium acid, high astringency; wine sound but rough.

*December 4.* Racked and taken to cellar.

1890. *January 20.* Condition bright, a rough, coarse, unpleasant wine. Lees show no abnormal germs.

*April 30.* Wine bright and sound.

*May 3.* Racked.

*May 16.* Lees show some lactic and acetic germs.

*June 9.* Bright, full-bodied, still coarse and rough but with less of the burnt flavor.

*July 31.* Lees sound.

1891. *January 2.* Little changed, still rough, but of fair quality.

*March 16.* Racked and part bottled.

*August 25.* Bottled.

*No. 1098. Zinfandel (first crop).* From Margherita Vineyard, Fresno. Bunches large and loose; grapes large; condition good; maturity past; the grapes had a cooked taste. The grapes arrived September 20, 1889, and were crushed the same day. Juice showed 32.2 per cent of solid contents. Fermentation of 116½ pounds crushed commenced September 21st, and continued very slowly. On September 25th the murk was still very sweet (temperature, 80°), and the vat was put into the hot-box (temperature, 95°). On the 26th the murk showed 17.2 per cent of solid contents. The cap had no acetous odor, and had a temperature of 90°. The murk was drawn off on September 30th, showing 12.9 per cent of solid contents, fermentation apparently having stopped. The yield from the above amount was 9.63 gallons, corresponding to 165.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *September 30.* Pressed and fortified.

*October 27.* By analysis the alcohol is 15 per cent; solid contents by spindle, 12.6 per cent.

1890. *January 6.* Condition bright, with a dark ruby color; agreeable bouquet, port-like; flavor fruity and agreeable, slightly burnt taste; acid and sugar rather too high; astringency full, and quality good.

*January 14.* Racked and divided into two parts: One, No. 1098, of 4½ gallons, placed in hot-box; temperature, 120° F. The other, No. 1098a, same quantity, kept at 90° F.

*May 14.* Both samples have been treated three months at the above temperatures. No. 1098a not clear; heavy bouquet; rather coarse-flavored; medium in acid; well-proportioned sugar; fair quality; racked again. No. 1098, condition turbid; rougher than No. 1098a; quality fair; racked.

*September 24.* Has a little port character.

1891. *June 22.* Bright, full flavored and clean-tasting; chief fault, over-sweetness; No. 1098a has not developed as well as No. 1098.

1892. *February 21.* Clear, orange colored; a sweet, coarse port of fair quality. No. 1098 is still somewhat smoother and more pleasing than No. 1098a.

The above record shows greatly in favor of a higher temperature than 90° F., for the maturing of Zinfandel port at least.

*No. 1099. Zinfandel (second crop).* From Margherita Vineyard, Fresno. General appearance very like the first crop, but rather more acid and small berries; condition good, but some bunches overripe. The grapes arrived September 20, 1889, and were crushed the same day. Juice showed 27.45 per cent of solid contents. Fermentation of 115 pounds crushed commenced September 22d, and continued slowly, the temperature never rising above 80.5°. On September 25th the cap was still firm, but had a slight acetous odor. On the 26th, cap still hard, the solid contents 12.7 per cent. On the 28th, the cap had become rather soft and the smell very acetous; the murk was therefore drawn off and fortified, showing 8.2 per cent of solid contents. The yield from the above amount was 9.5 gallons, corresponding to 163.6 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *September 28.* Pressed and fortified; solid contents, 8.2 per cent.

1890. *January 6.* Condition bright, with a dark-ruby color, port-like bouquet, but not very agreeable; good flavor, raw taste, high astringency, adequate sugar; quality rather good.

*January 14.* Racked and divided into two packages, one of 4 gallons, No. 1099, placed in hot-box of temperature of 120° F.; the other of 4½ gallons, No. 1099a, put in chamber of temperature of 90° F.

*May 14.* Both wines have received three months' treatment at the above temperatures; No. 1099a, condition not clear, insipid flavor, too high acid, quality inferior; No. 1099, condition nearly clear, acid rough, wine inferior; racked both samples again.

*September 24.* Very little of the port character.

1891. *January 22.* No. 1099 clear, thin acid, and generally poor.

1892. *February 24.* Little improvement; has become heavier and sweeter by evaporation.

### *Discussion of Results.*

In glancing at the above records we see that the sugar contents of the Zinfandel grapes in different seasons and grown in different localities, agree well together when the grapes were picked at the proper time, and then their acidity was adequate for a regular and complete fermentation. In fact, the percentages of sugar and of acidity contained in the first crop of the Zinfandel from Fresno do not differ materially from those of the same grape grown during the same seasons and in the different localities of Amador County and Santa Clara and Livermore Valleys. It must be remembered, however, that this agreement in the composition of the Fresno grapes with that of the same from other localities, is especially due to the peculiar condition of the first crop of the Zinfandel grown at Fresno, being usually of very uneven degrees of ripeness, and therefore unfit to be used in vinification; for which the second crop, which is abundant and uniformly matured, is generally used. But the high sugar contents that it usually reaches, and the low proportion of acidity, render even the second crop not very well adapted for the making of dry wines.

An exception in the first crop of Zinfandel with a high sugar contents is shown by No. 1098 from Fresno, No. 686 from Livermore, and No. 1071 from Amador, which had respectively 31.60, 26.99, and 25.76 per cent of sugar, and consequently a corresponding low acidity. This, as well as the similar case in the second crop, would not occur if the grapes were gathered earlier.

The Zinfandel from Amador has shown nearly the same difficulties as regards fermentation as the same grape from Fresno, in that, even with an adequate proportion of sugar and acid, their fermentation was longer than that of the same grapes from the Santa Clara Valley, while in the case of grapes containing a very large amount of sugar and low acidity, it was impossible to get the fermentation through, even taking the precaution of fermenting them in a temperature similar to that of their own climate. This difficulty, which occurs often in warm regions, can only be avoided by diminishing the density of the must, and by increasing its acidity; and this should preferably be done by blending with other grapes when readily at hand. But it is a well-known fact that in such regions the long-pruning system and an early picking of the grapes will, in most cases, render the correction of the must unnecessary.

According to the above records, as well as from other data, it appears that the Zinfandel from the foothills of the Sierra differs from that of the hot valleys in being a better keeper and acquiring more of truly vinous qualities, while much lower in tannin and, therefore, not as

harsh. (Only in the case of No. 1071 from Amador have we observed a high proportion of tannin and body.) The body also is lighter, and on the whole the product of the foothills is much more of the claret type.

Moreover, our experiments seem to show that while the first crop (when picked later) of Fresno Zinfandel will make a fair port-like wine when fortified, the second crop cannot be so well used for the same purpose.

The record and character of Nos. 717 and 691 are quite characteristic of the Zinfandel of the hot southern valleys generally. The first crop, which in the northern region is the principal one, is there mostly of the same uneven character described in No. 679. The second crop is considered the chief one; it is heavy, matures uniformly, and reaches high sugar contents. But the rest of the wine-making ingredients are not proportionately abundant, so that the wine, though alcoholic, is thin-bodied and prominently astringent, with little vinosity. It is therefore questionable whether the Zinfandel is a desirable grape for wine-making in these regions. It would seem advisable to adopt for dry wines some of the varieties, which in Europe have proved satisfactory under corresponding conditions, of the Italian or South French type. But unquestionably the special adaptation of the Fresno region is for sweet fortified wines.

#### BLAUER PORTUGIESER.

This variety is widely cultivated in Austria and Germany, where it yields a good and colored wine, but somewhat lacking in bouquet. It is therefore best adapted for blending with varieties yielding bouquet wines, but lacking color and body.

The vine is quite vigorous, and is not difficult to please in regard to its adaptation to different kinds of soils; it seems to prefer dry, stony, and light soils. It is valuable for northern and for mountain districts on account of its early maturity, and also of its large production. Both long and short pruning are suitable for it. It stands the attacks of the *peronospora* well, but it is rather liable to those of *anthracnose*.

At present it is largely propagated in the vineyards of southern France and in the Tyrol, where it is utilized for vinification, as well as for the table.

The typical characters of this variety are the following: Leaves rather large, as wide as long, a little downy on the lower surface, smooth on the upper one, a little sinuate. Bunches medium or above medium size, slightly winged, rather compact, and conical. Berries medium size, spherical, of a fine black color, and slightly pruinose at the time of maturity.

## ANALYSES OF WINES.

|                       | MUST.                          | WINE.                                                                       |
|-----------------------|--------------------------------|-----------------------------------------------------------------------------|
|                       | Ash .....                      | Ash .....                                                                   |
|                       | Acid as Tartaric.....          | Body .....                                                                  |
|                       | Sugar by Copper Test..         | Volatile Acid .....                                                         |
|                       | Solid Contents by Spindle..... | Total Acid as Tartaric.<br>At Six to Eight Months.....<br>At Pressing ..... |
|                       |                                | Tannin .....                                                                |
|                       |                                | Alcohol.<br>By Volume.....<br>By Weight .....                               |
| Date of Picking ..... |                                |                                                                             |

|                       | MUST.                          | WINE.                                                                       |
|-----------------------|--------------------------------|-----------------------------------------------------------------------------|
|                       | Ash .....                      | Ash .....                                                                   |
|                       | Acid as Tartaric.....          | Body .....                                                                  |
|                       | Sugar by Copper Test..         | Volatile Acid .....                                                         |
|                       | Solid Contents by Spindle..... | Total Acid as Tartaric.<br>At Six to Eight Months.....<br>At Pressing ..... |
|                       |                                | Tannin .....                                                                |
|                       |                                | Alcohol.<br>By Volume.....<br>By Weight .....                               |
| Date of Picking ..... |                                |                                                                             |

**\*Fortified.**

## COLOR READINGS.

| BLAUER PORTUGIESEK.     | 1888.                               |  | 1889.                             |  |
|-------------------------|-------------------------------------|--|-----------------------------------|--|
|                         | E. W. Hilgard,<br>Mission San José. |  | J. Gallegos,<br>Mission San José. |  |
|                         | No. 848.                            |  | No. 1057.                         |  |
| At pressing { Date..... | Sept. 20.                           |  | Sept. 16.                         |  |
| { Color.....            | 53.3 1 V. R.                        |  | 154.0 V. R.                       |  |
| One month.....          | 47.0 4 V. R.                        |  | 42.0 2-3 V. R.                    |  |
| Two months.....         | 48.2 4 V. R.                        |  | 39.2 2 V. R.                      |  |
| Three months.....       | 40.0 5 V. R.                        |  | 36.0 2 V. R.                      |  |
| Four months.....        | 40.0 4 V. R.                        |  | 35.7 2 V. R.                      |  |
| Five months.....        | 36.3 4 V. R.                        |  | 35.1 3 V. R.                      |  |
| Six months.....         | 36.3 4 V. R.                        |  | .....                             |  |

*No. 848. Blauer Portugieser.* From E. W. Hilgard, Mission San José. The grapes were grown on nine vines, grafted two years on *Californica*. The vine is a very strong grower, and bears from the fourth or fifth eye up to the tenth. It evidently needs longer pruning than it has had—say, ten eyes or canes. It protects its bunches well; almost no coulure, and no sunburn. It was about the earliest grape to become eatable, ahead of Pinots, and is pleasant eating. Although evidently a wine grape, it would bear shipment. The bunches are heavily shouldered, somewhat lax, but the stems are strong and rigid. The berries are below medium size, globular, with a light bloom only. Seeds quite long, and club-shaped. The grapes arrived and were worked on September 15, 1888. The juice showed 26.82 per cent of solid contents. Fermentation began on September 16th, and reached its maximum of 87° on September 18th. The next morning it was taken from the hot-box and placed in the ordinary fermenting room. On October 25th the muck was drawn off, five days from crushing. The yield from the amount was  $\frac{1}{4}$  of a gallon, corresponding to 136 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. November 19. Racked and taken to cellar; bouquet not far advanced; flavor nutty; body medium; acidity high; whole wine rather flat.

1889. April 5. Condition clear, with good color; acid, with suspicion of acetic ferment; racked again.

April 5. Lees show traces of lactic ferment; pasteurized the wine.

August 2. Condition turbid, with a very dark-red color; bouquet spoilt by lactic taint.

*No. 1103. Blauer Portugieser.* From J. T. Doyle, Experimental Plot, Cupertino. A few bunches of this variety came to hand September 27, 1889, and showed 28 per cent of solid contents. They corresponded to Pulliat's description, but were past maturity and beginning to dry.

*No. 1057. Blauer Portugieser.* From J. Gallegos, Mission San José. The grapes arrived on September 12, 1889, and were crushed the same day. They showed 24.8 per cent of solid contents. They correspond to Pulliat's description, except that the bunches are of medium size. Condition only fair, some grapes being dry or half dry, and a little moldy from having been picked too long; the juice was slightly pink colored. Fermentation of 35.5 pounds crushed reached its maximum of 84.5° on September 15th, then gradually fell to 75° on the following

day. The murk was drawn off four days from crushing. The yield from the above amount was  $2\frac{1}{2}$  gallons, or at the rate of 155 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 14.* Condition clear, with very dark color and rather insipid taste.

*November 2.* Racked and taken to cellar.

1890. *January 27.* Condition bright, with very dark color, strong and very pleasing bouquet, aside from slight suspicion of acetic taint; full flavor, alcohol, and acid; a clean taste; good quality, much improved; under the microscope the sediment shows some lactic germs.

*May 13.* Condition clear; has deteriorated since last tasting; sediment shows lactic ferment; pasteurized the wine.

*June 25.* But little improved.

### *Discussion of Results.*

The Blauer Portugieser has not been tried enough in California to decide definitely upon its qualities; but in the short time that we have cultivated it in our experimental plots, its reputation as a vigorous grower has been well maintained; it is a rather good bearer, and remains sound on the vines for some time. At the Mission San José plot, during its last period of maturity, we have seen the Portugieser keeping very well, after several heavy rains, while many other varieties were molding and decaying badly. The grapes are liable to attain a high amount of sugar. In general their acidity is rather low, and it seems to be still so, even when the proportion of sugar is small.

The wine, in its normal condition, is deeply colored, rather alcoholic, and heavy-bodied, of good astringency, but of low acidity. It has not shown itself to be a very good keeper, being very liable to the attacks of bitter and lactic ferments; but we have operated with quantities too small for good tests in this respect. On the whole, so far as we have been able to observe, it seems that its qualities and defects are well maintained in California, and therefore it should, as in Europe, rarely be used alone, but chiefly for blending purposes, in which case it may give very satisfactory results. We think that it may make a good blend with the Kadarkas, and intend to try it during the coming vintages. The wine maintains its color remarkably well.

### BLACK KADARKAS.

This variety is one of the most esteemed in Hungary, Croatia, and Styria. Its wine has a very agreeable aroma.

The typical characters of this variety are the following: Leaves large and long, somewhat cupped, thick, three to five-lobed; their upper surface is dark-green, but bright, while the lower one has a whitish-gray tint, and is downy. Bunches are large and close-packed; berries of medium size and round, when not flattened in the compact bunches; skin very thin and black; flesh very juicy and very aromatic. The grapes mature late, but they resist decay pretty well.





*No. 1125. Kadarkas.* From J. Gallegos, Mission San José. The grapes arrived October 21st, in good condition, but the amount was only sufficient for must analysis. Juice contained 23.60 per cent of solid contents. The bunches were small, cylindrical, and winged. The grapes agreed with Pulliat's description, but with tender skin and soft flesh, and quite light-colored. Maturity was complete.

*No. 1146. Kadarkas.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes were received October 4th in fair condition, and were crushed the following day. The bunches were medium sized, cylindrical, sometimes shouldered and rather compact; berries large and round; skin thin; flesh crisp and juicy, but without special flavor; stem very thick; pedicels long; maturity complete, but color quite pale. Juice showed 21.70 per cent of solid contents. Fermentation of 57.5 pounds crushed began on October 6th, and reached its maximum of 81° on the 7th. On October 8th the murk was drawn off, three and one half days from crushing, yielding from the above amount 5½ gallons, corresponding to 176.3 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *December 7.* Racked and taken to the cellar. A good, clean wine, though not quite clear, with faint and agreeable bouquet and flavor.

*1890. January 23.* Condition clear, but the wine has not improved in flavor. Lees show no unsound germs.

*April 3.* Racked again.

*May 19.* Lees show some lactic ferment; flavor good; very slight suspicion of lactic taint; pasteurized the wine.

*June 13.* Clear, with improved bouquet; good flavor and rather high acid; quality good.

*August 4.* Lees show a little acetic ferment.

*September 3.* Bright, and improved in bouquet; a trace of acetic flavor. Racked. The wine bottled on May 25th is much superior to that in the keg, and has less acid and more flavor.

*December 31.* Lees show filiform ferment.

*1891. January 7.* Mature and very good, but for slight "lactic" after-taste.

*February 18.* The wine bottled on May 25, 1890, is fresh and sound, and superior to the keg sample.

### *Discussion of Results.*

The Kadarkas has not been tried enough to decide definitely on its qualities in California. We may, however, point out the following general tendencies:

As a grower it has shown itself to be vigorous and very productive, very little attacked by coulure, but it requires short pruning, for under the long-pruning system it would be soon exhausted. On account of its late maturity it should be planted in south exposures, or in warm regions. It is not difficult to suit in respect to adaptation to soils of different nature, provided they are not wet. Under ordinary conditions, and from mature vines, the grapes may reach about 25 per cent of sugar.

Its wine, on the whole, is alcoholic, and of rather good body, of medium acidity, but (contrary to European experience) poor in color; it therefore should be used for making white wines, or as a blend with deep-tinted varieties; besides, it has a peculiar and agreeable aroma, and seems to be a good keeper.

### LAGRAIN.

This variety is especially cultivated in the Tyrol. Its typical characters are the following: Leaves round, thick and flat, three or five-lobed, slightly sinuate, the upper surface dark green, and the lower one downy, with a yellowish tint. The bunches are of medium size, somewhat long, and a little branched. The berries are of medium size, oval, but somewhat unequal; skin thin, very black, pruinose; juice somewhat colored.

## ANALYSES OF WINES.

|                                | WINE.                       | MUST.         |
|--------------------------------|-----------------------------|---------------|
| Ash .....                      |                             |               |
| Body .....                     | 3.15                        |               |
| Volatile Acid .....            |                             |               |
| Total Acid as Tartaric.        | At Six to Eight Months..... | No wine. .50  |
|                                | At Pressing .....           | .69 No wine.  |
| Tannin.....                    |                             | .299 No wine. |
| Alcohol.                       | By Volume .....             | 11.91         |
|                                | By Weight .....             | 9.56          |
| Ash .....                      |                             | .30           |
| Acid as Tartaric .....         |                             | .69           |
| Sugar by Copper Test..         |                             | 23.62         |
| Solid Contents by Spindle..... |                             | 23.30         |
| Date of Picking .....          |                             | Sept. 28      |
|                                |                             | Sept. 30      |
|                                |                             | Oct. 7        |
|                                |                             | Oct. 27       |
|                                |                             | Aug. 22       |

LAGRAIN.

|                |                                |          |
|----------------|--------------------------------|----------|
| 1889—No. 1123. | J. Gallegos, Mission San José. | Sept. 28 |
| No. 1135.      | J. T. Doyle, Cupertino.        | Sept. 30 |
| 1890—No. 1411. | J. T. Doyle, Cupertino.        | Oct. 7   |
| No. 1233.      | Margherita Vineyard, Fresno    | Oct. 27  |
|                |                                | Aug. 22  |

(COLOR READINGS.

|                       | No. 1135. | No. 1419.            |
|-----------------------|-----------|----------------------|
| Color at pressing     | 114.28    | 1 V. R. 149.0 V. R.  |
| Color at one month    | 70.00     | 1-2 V. R. 74.1 V. R. |
| Color at two months   |           | 60.6 4 V. R.         |
| Color at three months | 63.00     | 1 V. R. 49.4 3 V. R. |
| Color at six months   | 53.00     | 1 V. R.              |
| Color at seven months | 47.00     | 2 V. R.              |

*No. 1123. Lagrain.* From J. Gallegos, Experimental Plot, Mission San José. The grapes arrived October 1st in good condition; only a few bunches were received, sufficient for must analysis and description. Bunches large, branched, and loose; grapes medium size, nearly round; stems long and woody; pedicels long and strong; skin thick and astringent; flesh soft and juicy; maturity complete. Juice showed 25 per cent of solid contents.

*No. 1135. Lagrain.* From J. T. Doyle Cupertino. Grapes arrived October 3d, quite ripe, and in good condition, and were crushed the following day. Juice showed 23.30 per cent of solid contents. Bunches were medium size, pyramidal, with small shoulders, loose; grapes rather small and slightly oval; skin thick but not tough, rather astringent; color dark; flesh soft and juicy, and full of seeds; juice pink. Fermentation commenced October 4th, and reached its maximum of 79.5° on the 6th; the murk was drawn off October 8th, four and one half days from crushing. From 30 pounds crushed were obtained 2.3 gallons, corresponding to 158.3 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *December 3.* Racked and taken to the cellar; a raw wine, already bright, but with neutral bouquet and flavor.

1890. *January 30.* Racked again into one sample in a glass; bouquet and flavor both improved; lees show lactic ferment.

*May 13.* A bright wine, with considerable carbonic acid gas, and flat taste; pasteurized.

*June 23.* Clear, deeply colored, rough, and flavorless.

1891. *March 25.* Not quite clear; heavy deposit; sound, and though still rough, somewhat improved.

### *Discussion of Results.*

Like the Kadarkas, the Lagrain has not been sufficiently tried in California to decide upon its qualities; but as far as we have been able to observe, it seems that under the long-pruning system it is a vigorous and rather productive grower, but much injured by coulure. It matures late, and at about the same time as the Kadarkas, viz., during the month of October, the grapes reaching easily about 25 per cent of sugar. The wine is deeply colored, rather alcoholic and astringent, of good acidity and heavy body, and, on the whole, rather rough and slow to mature. It may make a good blend with the Kadarkas.

### GROSSBLAUE.

The Grossblau, more commonly known as Kölner, is cultivated chiefly in southeastern Europe, in Styria, Croatia, and Hungary. It imparts its character more especially to the wines of the former two countries, where it is used as well for the table; its handsome large bunches and berries render it acceptable in the latter respect. It is a hardy vine, even as regards damage from frost during bloom; is mostly pruned long, and even allowed to run over trees and hedges, and is, when so trained, a prolific bearer. Curiously enough, it is there reported as yielding a wine lacking color and body, while in California the deep tint and heavy body of its wine are among its recommendations; also a high percentage of tannin.

But it may be questionable if a long-pruned variety of only medium quality will pay in California, save locally, on account of special disabilities of other and better varieties.

The peculiar whitish-woolly, reddish-veined, deeply-cleft, and rather small leaves and reddish canes, with short, pronounced joints, render

this variety very easy of recognition. At any rate, the grape is adapted to blends needing color and tannin; while it cannot be considered as of high quality in other respects, being somewhat coarse in flavor, yet it is very much preferable to the Charbono, being less pronounced in character.

TABLE OF PRODUCTION AT EXPERIMENTAL PLOT, JOHN T. DOYLE'S VINEYARD, CUPERTINO.

| GROSSEBLAUE.  |                             | Number of Vines.. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs..... | Date of Picking... |
|---------------|-----------------------------|-------------------|---------------------------------------|----------------------------------|--------------------|
| 1887—No. 752. | Long-pruned .....           | 20                | 204                                   | 10.2                             | Oct. 19            |
|               | No. 755. Short-pruned ..... | 20                | 40                                    | 2.0                              | Oct. 19            |
| 1888—No. 911. | Short-pruned .....          | 20                | 95                                    | 4.8                              | Oct. 10            |
|               | No. 912. Long-pruned .....  | 13                | 315                                   | 24.2                             | Oct. 10            |
| 1889—Row 7.   | Short-pruned .....          | 17                | 100                                   | 5.8                              | Oct. 2             |

## ANALYSES OF WINES.

|               |                                        | Date of Picking | MUST.                     |                      |                  |     | WINE.                   |                    |                        |                        |
|---------------|----------------------------------------|-----------------|---------------------------|----------------------|------------------|-----|-------------------------|--------------------|------------------------|------------------------|
|               |                                        |                 | Solid Contents by Spindle | Sugar by Copper Test | Acid as Tartaric | Ash | Alcohol                 | Tannin             | Total Acid as Tartaric |                        |
|               |                                        |                 |                           |                      |                  |     |                         |                    | At Pressing            | At Six to Eight Months |
| 1883—No. 144  | H. W. Crabb, Oakville†                 |                 |                           |                      |                  |     |                         |                    |                        |                        |
| 1884—No. 144a | H. E. Pellet, St. Helena†              |                 |                           |                      |                  |     |                         |                    |                        |                        |
| 1884—No. 220  | H. E. Pellet, St. Helena               | Oct. 6          | 21.31                     | 20.61                | .56              | .18 | 9.92<br>10.35<br>9.20   | 240<br>250<br>.070 | .39<br>.40<br>.57      | .40<br>.31<br>.25      |
| 1886—No. 516  | J. T. Doyle, Cupertino                 | Oct. 5          | 17.20                     | 16.65                | .83              | .26 | *6.95<br>*6.95<br>*7.09 | .170               | .81                    |                        |
| No. 545       | J. T. Doyle, Cupertino                 | Oct. 22         | 18.60                     | 17.71                | .72              | .29 | 8.35<br>8.60<br>8.60    | .200               | .72                    |                        |
| 1887—No. 752  | (long-pruned), J. T. Doyle, Cupertino  | Oct. 19         | 23.82                     | 22.67                | .60              |     | 16.89<br>11.27<br>11.27 |                    | .60                    |                        |
| No. 755       | (short-pruned), J. T. Doyle, Cupertino | Oct. 19         | 26.26                     | 26.31                | .62              | .49 | 9.00<br>10.81<br>13.27  | .280               | .66<br>.62<br>.63      | 2.65<br>3.20<br>2.90   |
| 1888—No. 911  | (short-pruned), J. T. Doyle, Cupertino | Oct. 10         | 20.81                     | 21.22                | .57              | .35 | 7.78<br>9.73            | .270               | .65<br>.50             | 2.20                   |
| No. 912       | (long-pruned), J. T. Doyle, Cupertino  | Oct. 10         | 21.69                     | 21.80                | .63              | .20 | 9.92<br>12.36           | .204               | .52<br>.34             | 3.20                   |
| 1889—No. 1127 | J. Gallegos, Mission San José          | Sept. 29        | 24.80                     | 24.86                | .50              | .39 | 10.07<br>12.54          | .320               | .62<br>.34             | 3.08                   |
| 1890—No. 1381 | J. Gallegos, Mission San José          | Oct. 17         | 25.10                     |                      | .77              | .27 |                         | .263               |                        |                        |
| No. 1320      | J. T. Doyle, Cupertino                 | Oct. 11         | 22.70                     |                      | .58              |     |                         |                    | No wine.               |                        |

† Wines sent for examination. \* December, 1886. † June, 1887.

## COLOR READINGS.

| GROSSEBLAUE. | 1886.                                       |              | 1887.              |              | 1888.        |               | 1889.                          |  |
|--------------|---------------------------------------------|--------------|--------------------|--------------|--------------|---------------|--------------------------------|--|
|              | No. 516.                                    |              | No. 545.           |              | No. 752.     |               | No. 755.                       |  |
|              | J. T. Doyle's Experimental Plot, Cupertino. |              | Nos. 911, 912.     |              | No. 1127.    |               | J. Gallegos, Mission San José. |  |
| Must         | Rose.                                       | Pale rose.   | October 28.        | October 26.  | October 16.  | October 5.    |                                |  |
| At pressing  | October 14.                                 | November 1.  | 66.6               | 66.6         | 47.0         | 10.0          |                                |  |
| Color        | 40.8 2 V. R.                                | 57.1 2 V. R. | 1 V. R.            | 1 V. R.      | 37.0 2 V. R. | 1 V. to V. R. |                                |  |
| One month    | 35.7 1 V. R.                                | 39.6 2 V. R. | 47.0 V. R.-1 V. R. | 44.4 1 V. R. | 35.4 1 R.    | 61.0          |                                |  |
| Two months   | 25.1 2 V. R.                                | 39.6 2 V. R. |                    |              | 24.2 2 V. R. | 3-4 V. R.     |                                |  |
| Three months | 30.0 2 V. R.                                |              | 31.7               | 32.0 1 V. R. | 22.9 2 V. R. | 22.2          |                                |  |
| Four months  |                                             |              |                    |              |              | 2 V. R.       |                                |  |
| Five months  | 25.0 2 V. R.                                | 23.0 2 V. R. |                    |              |              | 2 V. R.       |                                |  |
| Six months   |                                             |              |                    |              |              | 24.3          |                                |  |
| Seven months |                                             |              | 30.7               | 22.2 3 V. R. | 16.3 5 V. R. | 15.6          |                                |  |
| Eight months | 23.5 2 V. R.                                |              |                    |              |              | 2 V. R.       |                                |  |

**No. 752 (long-pruned).** *Grossblau.* From J. T. Doyle, Cupertino, Experimental Plot. The grapes were crushed October 20th; condition good, but overripe; the stems flabby and rather dry, and berries more or less flabby; considerable early coulure, but berries of tolerably uniform and large size. In some bunches there were quite a number of dried, half-ripe berries; yet the whole will yield a fair sample of its kind of wine. The juice showed 23.8 per cent of solid contents. Fermentation of 100.75 pounds crushed reached its maximum of 88° on October 23d. On October 28th, eight days from crushing, the murk was drawn off. The yield from the above amount was  $8\frac{3}{16}$  gallons, or at the rate of 166 gallons per ton.

**RECORD OF TREATMENT AND TASTING.**—1887. *December 12.* A thin, dry wine with pronounced astringency. It was racked and pasteurized for safety.

1888. *February 9.* A bright, pleasant, though thin wine, somewhat advanced and developed since last tasting.

*May 5.* Wine of light bouquet, good acid and astringency, but a little coarse.

*June 11.* Condition bright, with a peculiar bouquet, strongly perfumed and very well developed; acid at first pleasant; astringency high. Racked the wine again.

**No. 755 (short-pruned).** *Grossblau.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes were crushed October 20th. Condition good, but overripe; a few dried berries unripe. The average size of bunches and berries was above that of the long-pruned, and the sweetness decidedly greater. The juice showed 26.26 per cent of solid contents. Fermentation of 40 pounds crushed reached its maximum temperature of 83° on October 23d. On October 25th, six days after crushing, the murk was drawn off. The yield was  $24\frac{3}{8}$  gallons, or at the rate of 140 gallons per ton.

**RECORD OF TREATMENT AND TASTING.**—1887. *December 20.* Wine bright, deep-tinted, with marked astringency and pleasant acidity; the best sample thus far seen from the grapes.

1888. *February 8.* The bouquet has developed very fairly; appears heavier-bodied than No. 752 (long-pruned), but not quite as smooth.

*April 18.* Wine pasteurized to make sure of preservation.

*June 16.* Bouquet well developed; a very fair wine.

*November.* Wine bright, with a full red color, good bouquet and body, pleasant flavor, full astringency; acid a little too low for any dilution; quality, as a whole, very good.

**No. 911 (short-pruned).** *Grossblau.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes (49 pounds) arrived October 12th, in good condition, and were crushed the same day. The bunches were small, berries large and typical, and even in size; coulure about 10 per cent; bloom medium; stems commencing to dry. Juice showed 20.81 per cent of solid contents.

**No. 912 (long-pruned).** *Grossblau.* From same locality (116 pounds), condition good, bunches small, stems still green, berries quite even in size and appearance, early coulure small. The bloom seems to be heavier than in case of the short-pruned; sugar and acid well proportioned. The juice showed 21.69 per cent of solid contents.

These two lots, Nos. 911 and 912, were united for fermentation, making in all 165 pounds; began to ferment on October 13th, and reached its maximum of 88° the following morning. On October 16th, four days from crushing, the murk was drawn off. The yield from 165 pounds was  $13\frac{1}{2}$  gallons, or at the rate of 163.6 gallons per ton.

**RECORD OF TREATMENT AND TASTING.**—1888. *December 13.* Taken to cellar.

*December 17.* Racked; condition clear; bouquet undeveloped; body and acid medium; astringency and alcohol fair; a neutral wine. Lees contain no unsound germs.

1889. *January 12.* Color faded to neutral, and little quality left.

*March 27.* Lees contained a small amount of lactic ferment; pasteurized the wine.

*May 14.* Racked; condition clear.

*August 19.* Condition bright, with good color, body, and bouquet; an agreeable and clean flavor and taste; medium acid, astringency, and alcohol; a wine of good quality, which stands dilution very well.

*November 5.* Tasting same as previous one; racked again.

*1890. February 10.* Lees show no unsound germs.

*February 25.* A bright wine; bouquet slightly diminished; agreeable flavor; wine well matured, but rather thin.

*March 3.* Racked the wine.

*July 17.* Lees show very little of lactic germs.

*July 23.* Condition clear, with light color; a thin and somewhat insipid wine.

*1891. February 26.* Wine bottled March 10, 1890, is bright and has no deposit; its general quality is good; but the same wine bottled later is slightly acetified and of inferior quality.

*No. 1127. Grossblau.* From J. Gallegos, Mission San José. The grapes arrived October 1, 1889, and were crushed the following day. Juice showed 24.80 per cent of solid contents. Their condition was good, but a little past maturity. Fermentation reached its maximum of 85.5° on October 4th. The murk was drawn off October 5th, three days from crushing. From 45.5 pounds 3.87 gallons were obtained, or at the rate of 172.5 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *November 25.* Condition bright, with a deep color, not pleasing bouquet, neutral flavor, rather flat taste, medium acid and alcohol, full astringency, and good body; quality undeveloped.

*November 27.* Racked and taken to cellar.

*1890. January 20.* Condition bright, with a very peculiar and disagreeable bouquet and flavor; wine still raw but seems to be sound; lees sound.

*April 2.* Racked; condition clear.

*April 30.* Condition bright; wine sound.

*May 15.* Sediment sound.

*June 13.* Wine improved very much since last tasting; its general quality is good.

*August 4.* Lees sound.

*1891. January 7.* A bright wine, well colored, with a strong bouquet and good flavor; quality very good, but a little over-mature.

*March 12.* Bottled the wine.

### *Discussion of Results.*

From the above record it appears that the Grossblau is at Cupertino, as well as at Mission San José, a good bearer if pruned long, and a poor one if pruned short. Substantially the same experience has been had in the Napa Valley.

The saccharine strength seems to vary greatly in different years. The low strength in 1886 was manifestly due to the youth of the vines; and the sugar reached a satisfactory degree in 1887, with a marked difference in favor of the short-pruned vines, which, however, gave only a very light crop. In 1888 the sugar was low again, and there was a little difference between the long and short-pruned, but in favor of the former. The sugar percentage in 1889 agrees well with the alcoholic contents of the wines of Crabb and Pellet in 1883; and we may take it for granted that under ordinary conditions this variety will produce a wine of fully 12 per cent of alcohol (volume) and over.

As to tannin, leaving out the product of the young vines in 1884 and 1886, it seems that this grape can be relied on for a high astringency.

The acid, as a rule, seems to be full, and well proportioned to tannin.

The body, like the sugar contents, seems subject to large variations from year to year; but in general a rather heavy body has been observed.

The Grossblau wines, tending to become thin and rather coarse, require an appropriate blending.



As to color, there is also great variation, the initial color ranging from 40.8 to as much as 100. It seems, however, to be fairly persistent, with the tint bluish-red or red.

In conclusion, it seems that the Grossblauue does not offer sufficient inducement for preferring it to other varieties of higher quality and better bearing under short pruning; the quality of its wines will scarcely pay for long pruning; and their inherent coarseness of flavor requires to be disguised by blending.

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## 6. PORT TYPE.

Portugal has a great variety of wines. This results in part from the very irregular surface of the country, the many different geological formations, the great differences in the nature of the soils, and the various exposures of the vineyards; producing altogether a considerable variety of soil and climatic conditions. In addition, there are a large number of grape varieties, and numerous different methods of grape culture and wine-making.

Among all these types of wines, the most important is, doubtless, the port wine, which, on account of its special and constant qualities, has acquired a great reputation; not only is it exported to all parts of the world, but it has been imitated in several viticultural countries.

Because of the importance that the production of this kind of wine may have for certain regions of California, where the production of dry wines is not satisfactory, we preface the description of the chief varieties and record of our experiments in regard to them, with a few considerations on the grapes used and on the character and manufacture of these wines.

Port wine is obtained principally on gravelly and stony soils, in the vineyards bordering the Douro River. It is a heavy wine, deeply colored, with an alcoholic aroma, of uniform character, but not fresh-tasting, nor fine and delicate like certain dry wines, as, for instance, those of the Bordeaux type.

Three classes of port wine are made in the Douro region. The first, which is the most made and best known, contains from 21 to 24 per cent of alcohol; the second, from 14 to 16 per cent, and the third from 12 to 13 per cent. There are no dry port wines in the true sense of the word; what the Portuguese call dry ports have from 1 to 2 per cent at least of sugar, and the others called sweet contain about 4 per cent of sugar. Doubtless they could be made drier, but the grading of the merchants and the commercial interest tend to maintain constant the type of wine which characterizes the genuine port.

The principal grape varieties in use in Portugal for the making of port wine are the following: Alvarelhao, Bastardo, Cornifesto, Donzelinho, Mourisco Preto, Mureto, and several "tintas," among which the most important are the Tinta Francisca, Tinta Amarella, and Tinta Cam, or Tinto Cão. All these grapes, under the special conditions of soil and climate in which they are grown, acquire deep color, a high proportion of sugar, and a characteristic aroma which thus far is only found in genuine ports.

The selection and blending of the grapes, as well as the degree of maturity at which they should be picked, depend upon the class of

port to be obtained, and upon the further manipulation to which the wine must be submitted. As a rule, the grapes are picked when they contain about 30 per cent of sugar. In every case they are sorted, and any green, moldy, or decayed berries removed; they are carefully crushed and fermented with their stems. During the first two or three days of vatting, the mass is aerated to a large extent, *the aeration being strong, and continued for many hours during day and night*; and in order to extract the largest amount of color, the cap is immersed several times during the violent fermentation. After the latter is over, the must is left to ferment for about seven to ten days more, according to localities and special conditions. At this time the color and density of the liquid is ascertained in some way, and as soon as the liquid has acquired a vinous odor and taste, and is agreeable and slightly astringent, the first fermentation is considered over, and then the murk is drawn off.

The wine is put in open casks having a capacity of from three to six thousand gallons; the press-wine is added to it, and also at the same time it is fortified with the addition of good wine brandy, in the proportion of 4 to 8 per cent. In these casks the wine remains undisturbed throughout the winter season; occasionally it is racked—for the first time in December. Upon reaching the temperature of the spring season the wine ferments again; when this fermentation is over, it is racked and put in the transporting and aging casks, which are sent to the cellars of Oporto or of Villa Nova de Gaya. There the conservation and aging of the wines require more or less time, and they sometimes stand for several years, during which the wine undergoes different treatments, such as successive clarifications with the white of eggs or fine isinglass, and the periodical rackings and aeration, which are considered very beneficial to this class of wines. The addition of brandy is still continued in those cellars, according to the judgment of the cellar-masters; and by these repeated additions, and by aging, the dark, bluish-red color is changed into reddish, or, as the Portuguese say, "red gold." Finally a small dose of brandy is added to the wine before it is exported.

In general, in California, the process for making this kind of wine has been carried on in a somewhat imperfect manner, especially as regards the repeated additions of brandy and the preliminary aeration. In most cases the impression is that any fair red wine, properly sweetened with grape syrup and fortified, constitutes a port wine. Commonly, also, sick wines are transformed into ports, and then a very unsatisfactory result naturally is obtained. Moreover, the ports produced here are rarely bright; even the opportunity for defecation that is given dry red wines in frequent racking is often not accorded to ports; and therefore their general quality is unsatisfactory. It is only by following the correct processes that such type of wine can be obtained.

#### BASTARDO.

This variety, extensively planted on the island of Madeira and in Portugal, is also quite widely cultivated in Spain for red wine. In California it has been supposed to be identical with the Trousseau, to which it bears some resemblance in its growth and aspect of bunches, but its far earlier maturity and the totally different character of its wine prove conclusively that it is distinct.

It has a strong and regular growth and matures early. Its bunches,

generally, are small, cylindrical or conico-cylindrical; berries of average size, regular and ovo-conical in form, entirely black and tough; flesh juicy, sweet, and very agreeable.

Professor Pulliat reports that the Bastardo can be grown perfectly in the central and even in the northern vineyards of France, and that the soil and climate of Beaujolais suit it very well.

Viscount de Villamajor says also that the wine for exportation (port wine) which is produced at the Bas-Corgo vineyards, is made mostly from the Bastardo and Alvarelhão (Pied de Perdrix) grapes.

In the Douro region wine is also made from the Bastardo grape alone, which is of "liqueur type," sweet and very fine.

TABLE OF PRODUCTION.

| BASTARDO.                                               | Number of Vines.. | Weight of Grapes,<br>in lbs. .... | Average Weight<br>per Vine, in lbs. | Date of Picking... |
|---------------------------------------------------------|-------------------|-----------------------------------|-------------------------------------|--------------------|
| 1887—No. 705. J. T. Doyle, Experim'tal Plot, Cupertino. | 20                | 155                               | 7.75                                | Oct. 6             |
| 1888—No. 889. J. T. Doyle, Experim'tal Plot, Cupertino. | 20                | 256                               | 12.65                               | Oct. 8             |
| 1889—No. 1086. J. Gallegos, Mission San José.....       | 20                | 180                               | 9.00                                | Sept. 26           |

## ANALYSES OF WINES.

| BASTARDO.      | Date of Picking.....                             | MUST.                  |       |                                |       | WINE.          |       |                |      |                         |          |                             |      |           |  |          |  |  |  |
|----------------|--------------------------------------------------|------------------------|-------|--------------------------------|-------|----------------|-------|----------------|------|-------------------------|----------|-----------------------------|------|-----------|--|----------|--|--|--|
|                |                                                  | Sugar by Copper Test.. |       | Solid Contents by Spindle..... |       | Alcohol.       |       | Tannin.....    |      | Total Acid as Tartaric. |          | Volatile Acid.....          |      | Body..... |  | Ash..... |  |  |  |
|                |                                                  |                        |       |                                |       | By Weight..... |       | By Volume..... |      |                         |          | At Six to Eight Months..... |      |           |  |          |  |  |  |
|                |                                                  |                        |       |                                |       |                |       |                |      |                         |          | At Pressing.....            |      |           |  |          |  |  |  |
| 1884—No. 283.  | Sept. 6                                          | 23.74                  | 23.14 | 25.76                          | 25.32 | 23.74          | 10.35 | 12.83          | .062 | .34                     | .51      | .10                         | 3.12 | .56       |  |          |  |  |  |
| 1887—No. 705.  | Oct. 6                                           | 25.32                  | 25.76 | 46                             | 38    | 10.26          | 12.73 | .235           | .39  | .65                     |          | 2.80                        |      |           |  |          |  |  |  |
| 1888—No. 841.  | J. Gallegos, Experimental Plot, Mission San José | 25.71                  | 42    | 30                             | 43    | 9.20           | 11.45 | 133            | .38  | .45                     |          | 2.30                        |      |           |  |          |  |  |  |
| 1888—No. 888.  | J. T. Doyle, Experimental Plot, Cupertino        | 23.47                  | 23.62 | 53                             | 43    | 11.46          | 14.00 | .162           | .36  | .47                     |          | 3.35                        |      |           |  |          |  |  |  |
| 1889—No. 1086. | J. Gallegos, Mission San José                    | 27.90                  | 28.20 |                                |       |                |       |                |      |                         | No wine. |                             |      |           |  |          |  |  |  |
| 1890—No. 1354. | J. T. Doyle, Cupertino                           | 25.77                  |       |                                |       |                |       |                |      |                         | No wine. |                             |      |           |  |          |  |  |  |

## COLOR READINGS.

| BASTARDO.                | 1887.                   |                                          | 1888.                          | 1889. |
|--------------------------|-------------------------|------------------------------------------|--------------------------------|-------|
|                          | J. T. Doyle, Cupertino. |                                          | J. Gallegos, Mission San José. |       |
|                          | No. 705.                | No. 889.                                 | No. 1086.                      |       |
| At pressing { Date ----- | October 13.             | October 12.                              | September 24.                  |       |
| One month { Color -----  | 7.5 3 R.                | 33. 3 R.+1 Y.                            | 10.4 2 V. R.+1 Y.              |       |
| Two months -----         | 7.0 2-3 R.              | Can no longer be read in the instrument. | 10.0 2 R.+1 Y.                 |       |
| Three months -----       | 7.3 3 R.                |                                          | 9.1 2 V. R.+1 Y.               |       |
| Four months -----        | 6.6 O. R.               |                                          | 9.1 3 V. R.+1 Y.               |       |
| Five months -----        |                         |                                          | 8.7 3 V. R.+1 Y.               |       |
| Six months -----         |                         |                                          | 8.3 1 V. R.+1 Y.               |       |
| Seven months -----       |                         |                                          |                                |       |

*No. 705. Bastardo.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 7, 1887, and were crushed the following day. Their condition was, in part, excellent, the remaining being very much shriveled, but otherwise little coulture. The lot will make a wine fairly representing its kind. The juice showed 25.32 per cent of solid contents. Fermentation of 79 pounds crushed began on October 9th, and reached its maximum of 87° on the 10th, remaining very high for 36 hours. On October 13th, five days from crushing, it was drawn off. The yield from the above amount was  $6\frac{5}{16}$  gallons, or at the rate of 160 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 7.* Racked the wine.

*December 19.* Low acid, heavy body, low astringency, and developing rapidly in vinosity; taste a little flattish, suspicion of milk-sourness. Examination with the microscope shows in the sediment lactic germs in small proportion, and considerable normal yeast.

1888. *February 16.* Condition bright, with an agreeable and well-advanced bouquet, medium and pleasant acid, and rather light body. On the whole, a pleasant but thin wine.

*April 26.* The microscope stills shows the sediment to contain lactic and traces of acetic germs; racked and pasteurized the wine.

*June 19.* Condition bright; a thin wine of no special merit.

*No. 889. Bastardo.* From J. T. Doyle, Cupertino. The grapes arrived and were crushed on October 9th. Condition good; grapes ripe, medium in size, oval-shaped; bloom heavy, bunches show effect of some early coulture; for the most part cylindrical, some shouldered. The juice showed 23.47 per cent of solid contents. Fermentation of 168 pounds crushed began on October 9th, and reached its maximum of 93° on the 11th. On October 12th, three days from crushing, the murk was drawn off, yielding from the above amount  $14\frac{1}{2}$  gallons, corresponding to 168.2 gallons per ton, showing a very juicy berry.

RECORD OF TREATMENT AND TASTING.—1888. *December 13.* Racked the wine; condition turbid.

1889. *January 18.* Taken to cellar.

*March 19.* Sediment shows small amount of lactic germs; pasteurized the wine.

*May 20.* Racked again; condition cloudy.

*August 2.* A poor, light-colored wine; exhausted to taste, with suspicion of butyric taint.

1890. *February 8.* Lees show a large amount of both lactic and acetic ferments.

*February 23.* A clear, thin wine, with very poor bouquet and flavor.

*February 28.* Racked again.

*March 4.* Wine put in glass.

*July 23.* No improvement; wine discarded.

*No. 1086. Bastardo.* From J. Gallegos, Mission San José. This variety arrived September 19, 1889, in good condition, but a little too ripe, a few grapes being dried up. Bunches medium, or small, not so close as the Chauché Noir, cylindrical and somewhat shouldered; grapes medium size and oval; skin rather tough; flesh quite firm, and agreeably flavored. The grapes were crushed on the day of arrival, the juice showing 27.9 per cent of solid contents. Fermentation started September 20th, and reached its maximum of 91° on the 21st. The murk was drawn off September 24th, five days after crushing. From the 62 pounds crushed 4.87 gallons were obtained, corresponding to 157 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. November 7. Racked and taken to cellar. A fair wine, but slightly bitter taste and suspicious odor.

1890. January 14. Same as above; wine nearly clear. Lees examined and found to be sound.

April 3. Racked again.

May 15. The sediment contains an abundance of lactic germs. Pasteurized the wine.

June 12, August 4, September 4. Wine tasted and examined, but no improvement.

1891. January 7. Lactic taste not so pronounced, but wine quite exhausted, and hence discarded.

### *Discussion of Results.*

In productiveness the Bastardo comes next to the Tinta Madeira among the port varieties that we have tried. In fact, at Cupertino, in 1888, it has given a crop averaging about 4½ tons per acre, and it has suffered but little from coulure and sunburn.

The grapes, in 1889, at Mission San José, easily reached 28.20 per cent of sugar, but the acidity was inadequate, being only .53 per cent. This was the only case of such a high percentage of sugar, and was due to overripeness; while in the previous years, 1887 and 1888, the amount of sugar varied from 23.47 to 25.71 per cent, and that of acidity from .30 to .46 per cent.

The wine obtained at the Experimental Cellar from the grapes from Mission San José, vintage of 1889, contained 14 per cent of alcohol, and the Bastardo is the only one of the grapes of this type that had so high alcoholic strength; it would therefore be placed among the second-class wines of the Douro region, Portugal. This wine had a rather good body, but very little color, and while its general quality was rather delicate, it has shown itself in every respect to be a very poor keeper, unsuited to dry wines.

The Bastardo by itself cannot, therefore, be recommended for vinification in California, for it does not maintain the quality that has contributed to its reputation in Europe; but a proper blend, and principally that with Alvarelhão, as practiced in Portugal, would doubtless remedy its deficiencies, and make a good quality of port wine.

For this purpose the culture of the Alvarelhão should be largely extended in those localities of the State which are suitable for the growing of port grapes, for it is the variety, that together with the Bastardo, is used in Portugal in the vinification of the export wines, or "ports."

### TINTA AMARELLA.

This is one of the best varieties of the Douro region, in Portugal; it is there a very large bearer and grows very well in strong soils.

Bunches are of good size, pyramidal or conical, heavily shouldered,

close. Berries medium size but irregular, varying from very small to rather large, and from nearly round to distinctly oval. Skin rather thick but not tough. Flesh firm but juicy, flavor sweet, not marked. Peduncle thick, strong, and woody. Pedicels rather long and of medium strength.

Generally it ripens about the middle of October at Cupertino, being therefore of rather late maturity.

It has been observed that this variety was much damaged by coulure at Mission San José and Cupertino, and very little at Fresno.

TABLE OF PRODUCTION.

| TINTA AMARELLA.                                           | Number of Vines. | Total Weight of Grapes, in lbs. | Average per Vine, in lbs. | Date of Picking. |
|-----------------------------------------------------------|------------------|---------------------------------|---------------------------|------------------|
| 1887—No. 768. J. T. Doyle, Experimental Plot, Cupertino.  | 20               | 150                             | 7.50                      | Oct. 20          |
| 1888—No. 936. J. T. Doyle, Experimental Plot, Cupertino.  | 20               | 235                             | 11.75                     | Oct. 23          |
| 1889—No. 1192. J. T. Doyle, Experimental Plot, Cupertino. | 20               | 180                             | 9.00                      | Oct. 17          |

## ANALYSES OF WINES.

| TINTA AMARELLA.                              | MUST.                |                                | WINE.                  |                       |          |                |                |             |                         |                             |                    |           |          |            |
|----------------------------------------------|----------------------|--------------------------------|------------------------|-----------------------|----------|----------------|----------------|-------------|-------------------------|-----------------------------|--------------------|-----------|----------|------------|
|                                              | Date of Picking..... | Solid Contents by Spindle..... | Sugar by Copper Test.. | Acid as Tartaric..... | Ash..... | Alcohol.       |                | Tannin..... | Total Acid as Tartaric. |                             | Volatile Acid..... | Body..... | Ash..... | Sugar..... |
|                                              |                      |                                |                        |                       |          | By Weight..... | By Volume..... |             | At Pressing.....        | At Six to Eight Months..... |                    |           |          |            |
|                                              |                      |                                |                        |                       |          |                |                |             |                         |                             |                    |           |          |            |
| 1884—No. 280. Natoma Company, Natoma†        | Sept. 19             | 20.08                          | 20.29                  | .47                   | .32      | 9.05           | 11.27          | .090        | .41                     | .60                         |                    | 2.36      | .45      |            |
| No. 281. Natoma Company, Natoma              | Sept. 19             | 20.08                          | 20.29                  | .47                   | .32      | 9.46           | 11.91          | slight      | .44                     | .53                         |                    | 2.39      | .47      |            |
| 1887—No. 768. J. T. Doyle, Cupertino.        | Oct. 20              | 23.01                          | 23.13                  | .57                   | .47      | 9.49           | 11.82          | .170        | .57                     | .60                         | .12                | 2.60      |          |            |
| 1888—No. 936. J. T. Doyle, Cupertino.        | Oct. 23              | 22.69                          | 23.13                  | .33                   | .38      | 8.27           | 10.36          | .130        | .37                     | .49                         |                    | 2.70      |          |            |
| 1889—No. 1117. J. Gallegos, Mission San José | Sept. 29             | 25.75                          | 25.88                  | .53                   | .39      | *14.50         | 17.90          | .154        | .42                     | .47                         |                    | 2.55      |          | 5.72       |
| No. 1192. J. T. Doyle, Cupertino.            | Oct. 17              | 23.70                          |                        | .38                   | .46      | *15.58         | 19.00          | .135        | .38                     | .93                         |                    | 2.77      |          | 1.83       |
| 1890—No. 1388. J. T. Doyle, Cupertino.       | Oct. 18              | 24.25                          |                        | .72                   |          | 9.92           | 12.38          | .210        | .60                     | .51                         |                    | 2.58      |          |            |
| No. 1388a. J. T. Doyle, Cupertino.           | Oct. 11              | 22.60                          |                        | .81                   | .90      | *16.17         | 18.68          | .086        |                         | .51                         |                    | 3.68      |          |            |
| No. 1340. J. Gallegos, Mission San José      | Oct. 11              | 22.60                          |                        | .81                   | .90      | 9.20           | 11.45          | .127        | .62                     | .44                         |                    | 2.58      |          |            |

† Not fully ripe. \* Fortified.



## COLOR READINGS.

| TINTA AMARELLA.         | 1887.                                      | 1888.             | 1889.                          |                         |
|-------------------------|--------------------------------------------|-------------------|--------------------------------|-------------------------|
|                         | J. T. Doyle, Experimental Plot, Cupertino. |                   | J. Gallegos, Mission San José. | J. T. Doyle, Cupertino. |
|                         | No. 768.                                   | No. 936.          | No. 1117.                      | No. 1192.               |
| At pressing { Date..... | October 25.                                | October 29.       | October 5.                     | October 21.             |
| { Color.....            | -----                                      | -----             | -----                          | -----                   |
| One month.....          | 37.4                                       | 3 V. R.           | 64.5 5 V. R.                   | 48.6 1 V. R.            |
| Two months.....         | 19.0                                       | 5 V. R.           | 15.3                           | 1 R.                    |
| Three months.....       | 26.2 1-2 R.                                | 16.6 5 V. R.      | 31.5 R.-1 R.                   | 13.1 5 V. R.+1 Y.       |
| Four months.....        | 13.8                                       | R.                | -----                          | -----                   |
| Five months.....        | 12.5 1 R.                                  | 16.0 R.           | 31.3 R.                        | -----                   |
| Seven months.....       | 12.2 1 R.                                  | 10.3 3 V. R.+1 Y. | -----                          | -----                   |

*No. 768* (long-pruned). *Tinta Amarella*. From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 21st and were crushed October 22, 1887. Their condition was good, just ripe, and stems green; berries turgid. Bunches triangular, broadly shouldered, sometimes continuing into a pendant prolongation, averaging 7 by 8 to 9 inches. Berries above medium size, almost globular, a little flattened at base, covered with a whitish bloom, covering a deep, black skin; the latter rather thick, and the whole grape rather fleshy and firm—almost a shipping grape. Peduncle rather long. Coulure about 10 per cent. The juice showed 23.91 per cent of solid contents. Fermentation of 99.25 pounds crushed began on October 23d, and reached its maximum of 86° on the morning of the 25th. Then in the afternoon, as it was the intention to make port of part of the sample, the mash was pressed; to one part of 3.5 gallons (*No. 768a*) was added one quart of alcohol. The latter, by analysis, was determined to be 17 per cent of the wine; sugar, 3.6 per cent. The remaining part of 4.5 gallons (*No. 768*) was fermented to dryness. The yield from 99.25 pounds of grapes was 8 gallons, or at the rate of 161.3 gallons per ton.

RECORD OF TREATMENT AND TASTING.—*No. 768. 1887. December 20.* Wine tastes acetified; racked and pasteurized it.

*1888. February 9.* Wine without character, rather thin, and has hardly recovered from pasteurizing.

*June 19.* Condition bright; acetous odor covers other properties; acid excessive. The sediment still shows, under the microscope, small amounts of acetic and lactic germs.

*No. 768a. Port sample.*

*1887. November 17.* Placed the package in hot chamber of 80° temperature.

*1888. February 27.* Taking a decided port taste; contains too much acid, but is not unsound.

*June 20.* Condition bright, well-developed and port-like bouquet, moderate acid and astringency, sugar all fermented out.

*July 1.* Added enough rock-sugar to make about 5 per cent in the wine.

*July 6.* Condition slightly turbid, with strongly port-like bouquet and medium acid and astringency. The microscope shows some amorphous sediment and effete yeast.

*No. 936. Tinta Amarella.* From J. T. Doyle, Cupertino. The grapes arrived October 24th in good condition, and were crushed the same day. Very few characteristic bunches, owing to late coulure; some bunches had raisins, others half-dried berries; early coulure about 8 per cent. Juice showed 22.69 per cent of solid contents. Fermentation of 153 pounds received began October 25th, and reached its maximum of 93.5°

on the 26th. The murk was drawn off on October 29th, five days from crushing. The yield from the above amount was  $12\frac{7}{8}$  gallons, corresponding to 168.3 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. Taken to cellar; taste sound and good.  
December 5. Racked in a better keg.

1889. March 14. Pasteurized for safety, trace of lactic ferment being found in the sediment.

May 15. Racked; clear wine.

August 9. Condition bright, with a fair but little yellowish color; pleasant flavor, a good taste and body; medium acid, astringency, and alcohol; stands dilution well.

November 19. Wine in keg good; no change in tasting of August 9th.

1890. February 11. Lees sound.

February 12. Condition bright, with improved bouquet and flavor, and very agreeable acid; general quality very good.

February 27. Racked.

July 17. Lees sound.

July 23. Bright, little flavor or bouquet, but clean tasting and mature.

August 13. Bottled.

1891. March 2. Wine bottled February 27, 1890, bright, fair color, rich and pleasing bouquet and flavor, clean and fresh tasting, and well matured. Wine bottled August 13, 1890, much inferior to the foregoing.

No. 1117. *Tinta Amarella*. From J. Gallegos, Mission San José. The grapes were received on October 1, 1889, in good condition and completely mature, and were worked the following day. Juice showed 25.75 per cent of solid contents. Bunches large, pyramidal, heavily shouldered, rather compact; grapes slightly oval, above the average size; skin thick, but not tough; flesh firm and juicy; flavor not marked, but agreeable. Fermentation commenced on October 3d, rising to  $103^{\circ}$  on the 4th; on the same day the murk was drawn off and fortified. Juice showed 10.6 per cent of solid contents. From the 59.5 pounds crushed 4.87 gallons were obtained, corresponding to 163.8 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. October 2. Crushed.

October 4. Pressed. Juice showed 10.6 per cent of solid contents; fortified with spirits of 75 per cent.

1890. January 6. In bright condition, with very deep color; agreeable bouquet and port-like flavor; clean taste; rather high sugar; medium acid and astringency; alcohol well blended; quality good.

January 13. Racked  $4\frac{1}{2}$  gallons.

January 14. Put in hot-box of  $85^{\circ}$  to  $90^{\circ}$  temperature.

May 14. Condition bright, with port-like bouquet; lacking in flavor; too much acid; quality not high. Racked and put in attic.

September 24. Little improvement.

1891. June 22. Bright; has toned down and is developing into a fair port. Chief faults are too much acid and too little body; the vines still too young for making port.

No. 1192. *Tinta Amarella*. From J. T. Doyle, Cupertino. The grapes were received October 18, 1889, and were crushed the same day. They were completely mature and in fair condition, but some of them were moldy on account of the rain. Berries were medium in size, but irregular, varying from very small to rather large, and from nearly round to distinctly oval. Juice showed 23.7 per cent of solid contents. To the 75 pounds of this variety crushed were added  $11\frac{1}{2}$  pounds ( $15\frac{1}{2}$  per cent) of Gros Mansenc dried for two weeks on straw. Fermentation commenced October 11th, and reached its maximum of  $77\frac{1}{2}^{\circ}$  on the 20th. The murk was drawn off on October 21st and fortified, solid contents being 10.1 per cent. The yield from the above amount was 7.37 gallons, corresponding to 166.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1890. January 6. Condition bright; acid rather deep-ruby in color; with medicinal, not agreeable, bouquet and flavor; adequate astringency, sugar, and acid; quality fair.

January 16. Racked  $6\frac{1}{4}$  gallons. Put in hot-box,  $85^{\circ}$  to  $90^{\circ}$ .

*May 14.* (Heated three months.) Condition bright, with rather good bouquet; sharp taste; quality poor. Racked and put in attic.

*September 24.* Little improvement.

*1891. June 22.* Has acquired a bitterish taste, otherwise little changed.

### *Discussion of Results.*

In production, the Tinta Amarella has shown itself to be a small or average bearer at Cupertino and Mission San José, and a strong bearer at Fresno. At Cupertino the maximum crop was obtained in 1888, the rate being about  $3\frac{1}{2}$  tons, much more than the Tinto Cão, but not as much as the Bastardo and the Tinta de Madeira.

As to the saccharine strength, only in one case of Mission San José grapes has it been as much as 25.75 per cent, while in all other cases it was below 24 per cent.

Its wine, light in alcohol, in color, and tannin, has shown itself to be a poor keeper, and even when fortified has not assumed a good quality, for the grapes lack those ingredients which are required for obtaining a faultless port. It is, however, probable that in strong soils and in a warmer climate, and by the blending with the Tinto Cão, or the Alvarelhão, the Tinta Amarella will prove very suitable for making a port wine of high quality. On the other hand, it is not suitable for making a dry table wine, on account of its only fair quality, and because it is not a good keeper, besides having a peculiar flattish flavor, which seems to belong to the grape, and disappears when the wine is made into port.

### ALVARELHÃO (LOCAIA, PIED DE PERDRIX).

This variety, known in California as Pied de Perdrix, but only very little cultivated, ought to be propagated more than has been done heretofore, because it is one of the best port wine varieties, which is blended with the Bastardo and other varieties, in order to remedy the deficiencies of the latter; this blend is largely exported from Portugal among the port wines. Its canes are almost upright and reddish or cinnamon-colored; leaves nearly medium size, glabrous on the upper surface and downy on the lower, deeply sinuate; bunches medium size, conico-cylindrical, not very compact, and branched; berries medium size, regular, oval; flesh rather firm, juicy, rather acid, but agreeable; skin black and pruinose at the time of maturity, which occurs early at the end of August. It is very liable to attack by the "oidium," or powdery mildew, but stands wet weather remarkably well. It is pruned long.

At Mission San José it matured late for its kind, and gave a small crop, while in the more suitable climate of Fresno it gave a better crop, and ripened early, but no samples sufficient for experimental working have been obtained. Whether this is the same grape grown under that name by Mr. Crabb, in Napa Valley, is a matter of doubt.

### MOURISCO PRETO (MOURISCO TINTO DO DOURO; UVA REI).

This is one of the most highly esteemed vines of the Douro region, and must not be confounded with the totally different Mourisco cultivated in the Minho country. The Mourisco Preto is described as follows: Trunk vigorous, with thick and but slightly adherent bark, which is not much ribbed. The growth starts regularly after the middle of March; the young shoots are but slightly pubescent and of a light color.

The canes are strongly inclined, short, with internodes averaging about 3 inches, but occasionally as much as 4½; nodes small and somewhat flattened. Color of bark, light brown and uniform; wood hard, with little pith. Leaves large, of uniform size, almost round; some five-lobed, with the lateral sinuses but slightly open, while the basal one is widely open; margin with large but rather obtuse teeth. The upper surface of the leaf is smooth, glabrous, brightly and uniformly green; the lower surface a little rough, hardly pubescent, pale green, and the principal veins strongly marked. Petiole medium length, thick, smooth, whitish green. Bunches numerous, mostly large, sometimes very large, pyramidal in form, more or less branched; peduncle large, thick, rather soft, light or yellowish green. Berries large, almost uniform in size, regular, flattened, and umbilicated, pale black, adhering strongly to the pedicels, which are long and nearly smooth; flesh quite firm, skin thick, juice sweet and very agreeable. It yields about 55 per cent of juice. It matures late in the second period.

No observations have been made on it at the Station since 1884, when grapes were received from Natoma vineyard on September 26th, and showed only 21.4 per cent of sugar, being from young vines. It was reported as bearing heavily; it doubtless belongs to the warmest parts of the State.

#### TINTO CÃO.

Tinto Cão, or Tinta Cam, is one of the oldest vines of the Douro region. According to Dr. Rebello this variety deserves one of the first places amongst those cultivated in Portugal. It ripens early, stands dryness as well as moisture, but is not a large bearer. Its wine is very dark colored, strong and fine. These qualities have given the great reputation in England to the wines called Guiães, which are made by blending the grapes of Tinto Cão, Pe-agudo, and Alvarelhão.

The vine spreads so much that its abundant wood and foliage prevent maturity; therefore, it requires short pruning, leaving three or four canes with three or four eyes on each, according to the vigor of the vine.

*Description*—Leaves large, smooth, three-lobed, acuminate, irregularly saw-toothed; petiole rose-colored; the upper side of the leaf is of a green color with some crimson spots; the lower side is very slightly downy. Canes reddish-colored. Bunches not very compact, but of average size and irregular. Berries round, bluish-black; pedicels not visible to the end; skin tough and thick; three seeds in the berry; juice sweetish-astringent.

TABLE OF PRODUCTION.

| TINTO CÃO.     |                                           | Number of Vines. | Total Weight of Grapes, in lbs. | Average per Vine, in lbs. | Date of Picking... |
|----------------|-------------------------------------------|------------------|---------------------------------|---------------------------|--------------------|
| 1887—No. 769.  | J. T. Doyle, Experim'tal Plot, Cupertino. | 20               | 80                              | 4.00                      | Oct. 20            |
| 1888—No. 966.  | J. T. Doyle, Experim'tal Plot, Cupertino. | 20               | 85                              | 4.25                      | Nov. 7             |
| 1889—No. 1200. | J. T. Doyle, Experim'tal Plot, Cupertino. | 20               | 55                              | 2.75                      | Oct. 23            |

## ANALYSES OF WINES.

| TINTO CÃO.     | Date of Picking..... | MUST.                          |                        |                       |           | WINE.           |             |                             |                   |
|----------------|----------------------|--------------------------------|------------------------|-----------------------|-----------|-----------------|-------------|-----------------------------|-------------------|
|                |                      | Solid Contents by Spindle..... | Sugar by Copper Test.. | Acid as Tartaric..... | Ash ..... | Alcohol.        | Tannin..... | Total Acid as Tartaric.     |                   |
|                |                      |                                |                        |                       |           |                 |             | At Six to Eight Months..... | At Pressing ..... |
|                |                      |                                |                        |                       |           |                 |             |                             |                   |
|                |                      |                                |                        |                       |           | By Volume.....  |             |                             |                   |
|                |                      |                                |                        |                       |           | By Weight ..... |             | Body .....                  |                   |
| 1884—No. 277.  | Sept. 23             | 21.50                          | 21.80                  | .53                   | .33       | 8.77            | Blended.    |                             | 2.70              |
| 1887—No. 769.  | Oct. 20              | 22.51                          | 22.23                  | .60                   | .36       | 10.91           | 250         | .56                         | 2.60              |
| 1888—No. 956.  | Nov. 7               | 26.57                          | 26.31                  | .32                   | .41       | 12.73           | 202         | .62                         | 2.70              |
| 1889—No. 1178. | Oct. 13              | 23.90                          | 24.12                  | .34                   | .45       | 9.20            | 167         | .53                         | 3.32              |
| No. 1200.      | Oct. 23              | 23.60                          | 22.67                  | .34                   | .46       | 8.98            | 193         | .51                         |                   |
| 1890—No. 1371. | Oct. 14              | 23.25                          |                        | .57                   |           | 9.20            | No wine.    |                             |                   |
| No. 1379.      | Oct. 18              | 23.07                          |                        | 1.03                  | .23       | 11.45           | .222        | .42                         | 2.78              |

## COLOR READINGS.

| TINTO CÂO.              | 1887.                                      |              | 1888.       | 1889.                          |                         |
|-------------------------|--------------------------------------------|--------------|-------------|--------------------------------|-------------------------|
|                         | J. T. Doyle, Experimental Plot, Cupertino. |              |             | J. Gallegos, Mission San José. | J. T. Doyle, Cupertino. |
|                         | No. 769.                                   | No. 956.     |             | No. 1178.                      | No. 1200.               |
| At pressing { Date..... | Oct. 28.                                   | Nov. 13.     |             | Oct. 19.                       | Oct. 29.                |
| { Color.....            | 70.0 1 V. R.                               | 53.3 1 V. R. | 34.2        | 1 V. R.                        | 33.3 1 V. R.            |
| One month.....          |                                            | 36.3 1 V. R. | 20.0        | 5 V. R.                        | 21.3 2 V. R.            |
| Two months.....         | 48.6 V. R.                                 | 38.1 1 V. R. | 13.65       | R. 1 R.                        |                         |
| Three months.....       |                                            | 36.3 1 V. R. | 12.0        | R. 1 R.                        |                         |
| Four months.....        | 26.2 3 V. R.                               | 34.8 2 V. R. | 12.0        | R. 1 R.                        |                         |
| Five months.....        |                                            |              | 11.5        | 1 R.                           |                         |
| Seven months.....       | 25.2 3 V. R.                               | 30.8 2 V. R. | 9.1 5 V. R. | +1 Y.                          | 16.0 1 R.               |

*No. 769. Tinto Cáo.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 21, 1887, and were crushed the following day. Their condition was perfect; stems and berries fresh and turgid, but ripe; bunches rather small, triangular, broadly shouldered, with short peduncle; rather loose, no coulure; size of berries quite small, skin delicate; soft, juicy flesh, but seeds quite abundant; taste sweet and sub-acid; bluish bloom, quite thick over the berry. The juice showed 22.51 per cent of solid contents. Fermentation of 79 pounds crushed began on October 23d, and reached its maximum of 83° on the 25th. The murk was drawn off on October 28th, eight days from crushing. The yield from the above amount was 5½ gallons, or at the rate of 142 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1887. *December 13.* Condition slightly turbid, with a perfectly dry taste, but the wine is somewhat acetified and not to be judged. A microscopical examination of the sediment shows the presence of acetic among the vinous germs as well as the flower of wine; must have been over-exposed to air during the first fermentation. Racked and pasteurized the wine.

1888. *February 9.* A bright, pleasant wine, with no appearance of unsoundness, apparently rehabilitated by pasteurizing; is well matured and has a good claret flavor.

*June 19.* Condition bright; bouquet fairly advanced; body light; pronounced astringency; acetic taint renders the acid sharp.

The microscope still shows more acetic than lactic germs in the sediment; racked again.

*No. 956. Tinto Cáo.* From J. T. Doyle, Cupertino. The grapes arrived November 9, 1888, in excellent condition, and were crushed the same day; stems just beginning to dry out, owing to the north wind of the previous two or three days; bunches small, very little coulure, considerable bloom; berries small. The juice showed 26.57 per cent of solid contents. Fermentation of 67 pounds received began November 10th, and reached its maximum of 85° on the 11th. The murk was drawn off on November 13th, four days from crushing. The yield from the above amount was 5 gallons and ½ pint, corresponding to 151.1 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1888. *December 3.* Taken to cellar.

*December 17.* Wine racked; a rather good wine; lees sound.

1889. *March 7.* Pasteurized on account of lees containing some lactic germs.

*May 29.* Racked; condition clear.

*August 9.* Bright condition, with dark violet-red color, a marked and pleasant bouquet; flavor neutral; clean taste; good body and quality; medium astringency and acid; full alcohol; stands dilution well.

*November 12.* Taste same as on August 9th, but the flavor is more developed, and wine in general more mature; quality high.

*1890. February 11.* Lees sound.

*February 15.* Condition bright; the color held well; bouquet and flavor are well developed and agreeable; taste mature and clean.

*March 10.* Racked.

*No. 1178. Tinto Cão.* From J. Gallegos, Mission San José. The grapes arrived October 16, 1889, in fair condition and completely matured. Bunches under the average in size, shortly conical shouldered, and compact; grapes small and round, skin thick and tough, flesh rather firm, with a rather acid juice; stems short and thick. The juice showed 23.90 per cent of solid contents. Fermentation started October 18th, the day after crushing. The murk was drawn off in the height of fermentation, 81°, on the 19th, two days after crushing, and on October 20th the wine was dry. From 45.5 pounds crushed 3.75 gallons were obtained, corresponding to 164.83 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 17.* Crushed.

*December 9.* Condition bright, and of a dark color; very little bouquet; an agreeable and peculiar flavor; clear taste; adequate acid; full astringency; high alcoholic strength; good quality. Racked and taken to cellar.

*1890. February 6.* Lees sound.

*May 6.* Condition clear; lees sound; racked.

*May 15.* Lees show young lactic germs.

*May 31.* Condition clear; somewhat acetous odor and taste; pasteurized.

*June 23.* Condition not clear; bouquet acetic; color light. Wine not having improved, was discarded. It is evident that this wine should have been pasteurized earlier.

*No. 1200. Tinto Cão.* From J. T. Doyle, Cupertino. The grapes arrived October 24, 1889, in fair condition and maturity. Bunches rather larger than the same variety from Mission San José, probably because of greater age of vines. The grapes were worked the same day. The juice showed 23.6 per cent of solid contents. Fermentation commenced October 26th, and continued slowly for four days, the maximum temperature reached being 78°. The yield from 24 pounds crushed was 1.87 gallons, or 156.25 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 24.* Crushed.

*December 10.* Condition not quite clear, but of a fair color; undeveloped bouquet; rather pleasant flavor; raw taste; medium acid and astringency; quality too new to judge; racked into bottles and taken to cellar.

*1890. January 27.* Condition clear; the bouquet and flavor have something peculiar, and hardly agreeable; quality not much if at all improved; racked; lees show lactic ferment.

*May 8.* Nearly clear; taste inky; pasteurized.

*June 23.* Nearly clear, with light bouquet and flavor; lacking in body; quality fair; deteriorating, and therefore discarded.

### *Discussion of Results.*

In production, the Tinto Cão has shown itself to be a poor bearer; at the Cupertino Experimental Plot, the maximum crop obtained from it was at the rate of 1½ tons per acre; this being much less than was obtained in its native country (Portugal) before the appearance of phylloxera. It is true that the Tinto Cão, like all the other port varieties, could not be expected to give very satisfactory results, or to make good dry wines, unless planted in suitable warm locations; in fact, the same varieties grown at Fresno always gave a more abundant crop, and of better quality.

The sugar content has reached only in one case (1888) the percentage of 26.57 per cent, while in other seasons, at Cupertino and Mission San

José, a lower percentage was noted, and therefore the amount of alcohol in the wine was somewhat inferior to that contained in the third-class wines of the Douro, which is from 12 to 13 per cent of alcohol.

On the whole the wine from this variety has proved to be heavy-bodied and astringent, but lacking in acidity, and with only fair color; quality for dry wines only fair, and the wine difficult to keep; but we may expect to obtain good wines from it if planted in suitable locations, and by a proper blending. The experience had thus far is hardly sufficient to form a decided opinion of its ultimate value.

#### TINTA DE MADEIRA.

This is one of the several "Tintas" (black varieties) growing on the island of Madeira.

Bunches medium size, cylindrical or conico-cylindrical, shouldered, sometimes loose, sometimes rather compact. Berries medium size, round; skin thick but tender, dark colored; flesh juicy, without marked flavor. Peduncles green, of medium thickness. Pedicels slender and rather long. Generally it matures some days after the Tinta Amarella.

TABLE OF PRODUCTION.

| TINTA DE MADEIRA.                                         |  | Number of Vines.. | Total Weight of<br>Grapes, in lbs.... | Average per Vine,<br>in lbs..... | Date of Picking. |
|-----------------------------------------------------------|--|-------------------|---------------------------------------|----------------------------------|------------------|
| 1887—No. 706. J. T. Doyle, Experimental Plot, Cupertino.  |  | 20                | 16                                    | 0.8                              | Oct. 6           |
| 1888—No. 884. J. T. Doyle, Experimental Plot, Cupertino.  |  | 18                | 135                                   | 7.5                              | Oct. 3           |
| 1889—No. 1152. J. T. Doyle, Experimental Plot, Cupertino. |  | 20                | 260                                   | 13.0                             | Oct. 8           |



## ANALYSES OF WINES.

| TINTA DE MADEIRA. | MUST.                |       |       |    | WINE.                          |              |                             |     |                         |      |             |  |
|-------------------|----------------------|-------|-------|----|--------------------------------|--------------|-----------------------------|-----|-------------------------|------|-------------|--|
|                   | Date of Picking..... |       |       |    | Solid Contents by Spindle..... |              | Sugar by Copper Test..      |     | Acid.....               |      | Ash .....   |  |
|                   |                      |       |       |    | By Weight .....                |              | By Volume.....              |     | Alcohol.                |      | Tannin..... |  |
|                   |                      |       |       |    | At Pressing .....              |              | At Six to Eight Months..... |     | Total Acid as Tartaric. |      | Body .....  |  |
|                   |                      |       |       |    | Sugar.....                     |              |                             |     |                         |      |             |  |
| 1884—No. 278.     | Sept. 7              | 21.38 | 21.23 | 56 | 27                             | Sample lost. | .38                         |     |                         |      |             |  |
| 1887—No. 706.     | Oct. 6               | 25.36 | 25.88 | 57 | 43                             |              | .51                         |     |                         | 2.30 | 3.33        |  |
| 1888—No. 884.     | Oct. 3               | 23.32 | 24.12 | 31 | 40                             |              | .43                         | .59 |                         | 2.99 |             |  |
| 1889—No. 1118.    | Sept. 28             | 24.12 | 24.12 | 40 | 44                             | *14.42       | .24                         | .47 |                         | 2.95 |             |  |
| 1889—No. 1152.    | Oct. 8               | 23.90 | 23.13 | 36 | 35                             | 9.20         | .33                         | .41 |                         | 4.32 |             |  |
| 1890—No. 1363.    | Oct. 14              | 27.45 | 23.90 | 54 | 35                             | *16.23       | .104                        | .56 |                         | 4.32 |             |  |
| No. 1247.         | Aug. 24              | 24.80 | 24.22 | 50 | 43                             | *16.25       | .126                        | .45 |                         | 3.62 |             |  |
| No. 1301.         | Oct. 4               | 23.70 | —     | 57 | 30                             | 9.41         | .53                         | .38 |                         | 2.82 |             |  |
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**\*Fortified.**

## COLOR READINGS.

|                   |       | 1887.                                      |              | 1888.                          |              | 1889.                   |  |
|-------------------|-------|--------------------------------------------|--------------|--------------------------------|--------------|-------------------------|--|
| TINTA DE MADEIRA. |       | J. T. Doyle, Experimental Plot, Cupertino. |              | J. Gallegos, Mission San José. |              | J. T. Doyle, Cupertino. |  |
|                   |       | No. 706.                                   |              | No. 884.                       |              | No. 1118.               |  |
|                   |       |                                            |              |                                |              |                         |  |
| Must              |       | Pale red.                                  |              |                                |              |                         |  |
| At pressing       | Date  | Oct. 14.                                   | Oct. 9.      | Oct. 5.                        | Oct. 14.     |                         |  |
|                   | Color | 30.3 4 V. R.                               | 26.8 3 V. R. | 48.6 2 V. R.                   | 32.5 2 V. R. |                         |  |
| One month         |       | 25.0 1-2 V. R.                             |              | 27.6 4 V. R.                   |              | 29.9 5 V. R.            |  |
| Two months        |       | 21.6 Sample lost                           |              | 21.6 4 V. R.                   |              | 22.2 3 V. R.            |  |
| Three months      |       | in Decem-                                  |              | 18.2 4 V. R.                   |              | 23.9 5 V. R.            |  |
| Four months       |       | ber; glass                                 |              | 16.3 R.                        |              | 17.7 4 V. R.            |  |
| Five months       |       | vessel                                     |              |                                |              |                         |  |
| Six months        |       | broken.                                    |              |                                |              |                         |  |
| Seven months      |       |                                            |              |                                |              | 15.6 4-5 V. R.          |  |

*No. 706. Tinta de Madeira.* From J. T. Doyle, Experimental Plot, Cupertino. The grapes arrived October 7, 1887, and were crushed the following day. Their condition was only fair, somewhat overripe; stems partly dry; berries a little soft and flabby. Bunches medium size, cylindro-conic, short-stemmed, almost compact; berries medium size, with heavy bloom, slightly oblong, with a peculiar, flatish flavor, not at all pleasant; very sweet; acid light; skins rather thin, and a pulp adhering to kernels as in American grapes; kernels quite short, cordate, short-stemmed. The juice showed 25.36 per cent of solid contents. Only a few pounds of grapes were received—not enough to judge of their quality in the vinification.

*No. 884. Tinta de Madeira.* From J. T. Doyle, Cupertino. The grapes arrived October 3, 1888, in good condition, and were worked the same day. Some bunches had mold, and nearly all had raisins; coulure was from 2 to 20 per cent. Bunches medium size, and somewhat shouldered; berries not even in size and not very sweet; heavy bloom. Juice showed 23.32 per cent of solid contents. Fermentation of 93.5 pounds received started October 6th, and reached its maximum of 36° on the afternoon of the 7th. The muck was drawn off October 9th, four days from crushing. The yield from the above amount was 8 gallons, corresponding to 171.2 gallons per ton.

RECORD OF CRUSHING AND PASTING.—1888. November 28. Taken to cellar.

December 18. Wine clear, almost bright, with very fruity bouquet, but agreeable and pleasant, or so short a time, acid and tannin adequate; quality fine for port. Lees show a very faint trace of active ferment.

xxx. Bunches 1. Uncrushed.

May 18. Bunches 2. Condition bright and of a good red color; a little bouquet; taste slightly

of bouquet, good body, medium acid, tannin, and astringency; scum dilution well.

xxx. Bunches 3. Lees show but a trace of active ferment.

September 9. Wine clear, with a little acid, and quality deteriorated since last tasting.

xxx. Bunches 4. Bunches.

July 16. Wine deteriorated and iscaried.

*No. 1118. Tinta de Madeira.* From J. Gallegos, Mission San José. The grapes arrived October 1, 1889, in good condition and were worked the following day. Bunches medium size, cylindrical-shouldered and looser; grapes small and nearly round, skin thin and tender, flesh soft

and juicy, stems thin, pedicels long and slender, flavor not marked. The grapes were mature and the juice showed 23.9 per cent of solid contents. Fermentation began October 3d, and rose to its maximum of 102.5° on the 4th; on the afternoon of the same day, two days from crushing, the murk was drawn off, and showed 7.8 per cent of solid contents. It was then fortified by the addition of spirits. From 55.5 pounds crushed 4.88 gallons of wine were obtained, corresponding to 175.7 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *October 2.* Crushed.

*October 4.* Pressed; juice showed 7.8 per cent of solid contents; fortified with spirits at 75 per cent.

*1890. January 6.* In a bright condition, with a very deep color; not showing much of the port character in flavor and bouquet; clean taste; medium acid and astringency; adequate sugar; alcohol rather prominent; quality fair.

*January 13.* Racked 3½ gallons.

*January 14.* Put in hot-box at the temperature of 85° to 90°.

*May 14.* Taken from hot-box.

*June 14.* Racked; wine not quite clear, with little flavor and bouquet.

*September 24.* Clear; lacks body.

*1891. June 22.* Bright; considerably improved in flavor and bouquet; superior to No. 1117, the Tinta Amarella from Mission San José.

*No. 1152. Tinta de Madeira.* From J. T. Doyle, Cupertino. The grapes arrived October 9, 1889, in good condition and completely mature, having been picked the day after a heavy rain. The grapes were rather larger, and the flesh rather firmer than the same variety from Mission San José. The juice showed 23.90 per cent of solid contents. Fermentation commenced October 11th, and reached its maximum of 88.5° on the 12th. On October 14th the murk was drawn off, four days from crushing; 8½ gallons were obtained from the 97 pounds crushed, or at the rate of 175.2 gallons per ton.

RECORD OF TREATMENT AND TASTING.—1889. *December 2.* Condition clear and of good color; a suspicious and not agreeable bouquet; flavor agreeable; smooth taste; adequate acid and astringency; quality rather good.

*December 7.* Racked and taken to cellar.

*1890. January 23.* A clear wine, but bouquet still not good, perhaps due to mold. Lees show lactic ferment.

*March 13.* Pasteurized.

*June 1.* Wine clear; bouquet and flavor have improved, but wine tastes exhausted and flat; quality fair.

*July 31.* Lees show lactic germs.

*September 4.* Clear; not improved.

*1891. January 2.* Bright; no worse, but has slight lactic taint.

*March 2.* Bottled wine from keg. Wine bottled March 18, 1890, spoilt.

### Discussion of Results.

In productiveness the Tinta de Madeira at the Cupertino Experimental Plot gave, in 1889, the largest crop of all the port varieties, the rate being about 4½ tons per acre. It had also very much less coulure than the Tinto Cão and the Tinta Amarella.

The amount of sugar in the grapes varied from 24 to 25 per cent, and therefore the proportion of alcohol in the wine has been about 12 per cent. Its wine, somewhat astringent, lacks acidity; and its fortified sample, not exceeding 17.80 per cent of alcohol, has proved to be of fair quality and the best of all the samples of port wine that were obtained from the same localities, Mission San José and Cupertino.

So far as the record shows, it seems that among the port varieties tried, the Tinta de Madeira would probably, *by itself*, produce the best wine of the port type, but evidently it requires a warmer location, and doubtless the product can be improved by appropriate blends.

These conclusions are well confirmed by the experiment of 1890.

## AVERAGE YIELD OF MUST PER TON OF GRAPES FOR 1887-88-89.

*Bordeaux Type.*

|                          | Gallons. |
|--------------------------|----------|
| Malbeck .....            | 150.8    |
| Cabernet Franc .....     | 154.3    |
| Cabernet Sauvignon ..... | 161.0    |
| Gros Verdot .....        | 165.4    |
| Gros Mansenc .....       | 160.9    |
| Tannat .....             | 150.3    |
| Merlot .....             | 157.3    |
| Gamay Teinturier .....   | 149.8    |
| Teinturier Mâle .....    | 151.5    |
| Saint Macaire .....      | 154.6    |

*Burgundy Type.*

|                          |       |
|--------------------------|-------|
| Black Pinots .....       | 148.9 |
| Meunier .....            | 156.1 |
| Pfeffer's Cabernet ..... | 166.6 |
| Chauché Noir .....       | 153.3 |

*Italian Type.*

|                              |       |
|------------------------------|-------|
| Barbera .....                | 159.2 |
| Freisa .....                 | 165.6 |
| Bonarda .....                | 164.9 |
| Nebbiolo .....               | 156.8 |
| Crabb's Black Burgundy ..... | 166.0 |

*Southern French Type.*

|                      |       |
|----------------------|-------|
| Aramon .....         | 167.9 |
| Cinsaut .....        | 176.5 |
| Mondeuse .....       | 160.5 |
| Grenache .....       | 149.3 |
| Mourastel .....      | 164.8 |
| Mataro .....         | 163.7 |
| Trousseau .....      | 152.3 |
| Petit Bouschet ..... | 152.3 |
| Sirah .....          | 153.1 |
| Ploussard .....      | 161.1 |
| Carignane .....      | 158.9 |

*Austrian and Hungarian Type.*

|                 |       |
|-----------------|-------|
| Grossblau ..... | 167.4 |
| Zinfandel ..... | 154.8 |

*Port Type.*

|                        |       |
|------------------------|-------|
| Tinto Cão .....        | 152.8 |
| Tinta Amarella .....   | 165.3 |
| Tinta de Madeira ..... | 174.0 |
| Bastardo .....         | 165.0 |

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## PART III.

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# PRESERVATIVE AND REMEDIAL PROCESSES

APPLIED TO

# WINES OF WARM COUNTRIES.

PREPARED BY L. PAPARELLI.

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1. Pasteurization.
  2. Chamberland Filtration.
  3. Electrical Treatment.
  4. Ozonization.
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## PASTEURIZATION OF WINE.\*

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In February, 1887, a bulletin (No. 66) was published, giving in a summary manner, information on the subject of the pasteurization of wines; that term having been adopted for the treatment devised by Pasteur for the final repression of all fermentative action in wine, of whatever kind, by the application of a moderate and strictly guarded degree of heat, under complete exclusion of air.

The peculiar conditions under which the vintage of 1887 was made, involving the introduction of much unsound material into the wine vats, unless carefully hand-picked beforehand, together with the frequent use of overripe grapes, combined to make an unusual proportion of wines that, if not unsound at the very outset, were exceedingly liable to become so under the slightest provocation. Most of that bulletin is reprinted here, for the information of wine-makers, and with the strenuous recommendation that at least, no winery intending to *age* wines should remain without the command of a pasteurizer of sufficient capacity to allow of prompt interposition, not only in cases of actual and obtrusive unsoundness, but whenever a suspicion of danger arises. Such danger will be of very common occurrence so long as the practice of fermenting with free access of the hot air of our vintage season to the uncovered pomace cap, or to the thin layer of wine on top of barely submerged grated frames or "false bottoms," continues to prevail. All who have analyzed California wines, or examined their sediment with the microscope, must testify to the prevalence of the acetic taint especially. The latter mode of examination is so wholly within the power of any person of ordinary intelligence, and defines the condition of the wine with such absolute certainty, that it is greatly to be regretted that the microscope should not, with the must spindle and mash thermometer, form a more common appliance in all well-regulated wineries. It might seem too "bookish," and "unpractical," to a great many, but those availing themselves intelligently of its services, would soon be amply rewarded for their expense and trouble, in saving wines from progressing too far on the way to unsoundness. It will indicate the propriety of resorting to pasteurization long before the most delicate taste can recognize any fault in the wine.

It cannot, however, be too strongly enjoined upon those who desire to avail themselves of pasteurization, that, at least for all bouquet wines, in which some quality is expected to be maintained, a sufficient *length*, and sufficiently *small diameter*, of the heating coil, and ample cooling power, be looked to. The pipe should, in all cases, be of block tin, not over half an inch, and preferably less, in (clear) diameter; and the greater its length and the mass of the heating water-bath, the less liability will there be to injure any portion of the wine by imparting a "cooked" taste. *A short and wide heating coil involves the use of a high*

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\*This part in regard to pasteurization of the wines has been reprinted here, with a few modifications and additions, from the report on Experiments on Different Methods of Fermentation, by Prof. E. W. Hilgard, 1888.

*temperature of the bath*, if the output is to be a reasonably large one; and this is liable to lead to overheating of the exterior portions of the passing wine, while interior threads may possibly escape adequate heating, and thus remain to re infect the wine.

Adequate cooling power is very essential in order to prevent any contact of *warm* wine with the air; and the emerging stream of wine should not be allowed to "break" as it passes into the receiving cask, thus avoiding unnecessary aeration. Strict attention to these points will greatly abridge the period of "flatness" that follows pasteurization, and which requires from three to eight weeks to subside. It is useless to taste a wine immediately after pasteurization, for it then holds in suspension the sediments brought down by the heating, which impress the palate so much as to render a judgment regarding the result of the operation impossible.

Pasteurizing, like all other operations in handling wine, requires a little experience, both in the management of the temperature and the maintenance of the best conditions for the welfare of the wine. Pumping directly into the coil is altogether undesirable; the wine should be pumped or run into a receiving cask, from which it descends through a siphon at a nearly constant pressure, greatly facilitating the maintenance of a steady temperature.

The fining of wines after pasteurization should always be deferred for some weeks, in order to assure the coming-down of all the sediments prior to fining. In many cases the sediment comes down so promptly and in such compact form that, in small packages at least, no fining is needed, and the simple filtration of the turbid liquid after racking is preferable.

#### THE PRINCIPLES AND PRACTICE OF PASTEURIZING.

The essential point in pasteurizing is to heat wine to the temperature of 150°, or thereabouts, out of contact with air. This heating should be done as quickly as possible, and after the proper temperature has been reached it is best, other things being equal, to cool the wine as quickly as possible.

Several objects are accomplished by this heating. The one most generally aimed at is to kill the germs of all kinds of fermentation that may exist in the wine, in order that it may be safe from further changes under their influence. Another is to advance the wine toward maturity; also, to forestall any further deposition of sediment, by the coagulation of the albuminous matters it still contains, and which endanger its soundness.

The general plan in the construction of pasteurizers is usually the same as that of the various kinds of still condensers; only, in this case the water around the worm is hot, and the cold wine, in passing through the worm, is heated to the proper point by allowing it to move with greater or less rapidity, in a solid column, so that a thermometer inserted at the exit end will show steadily the desired temperature. Beyond the thermometer, the wine passes into a cooler, from which it is delivered into the (well-cleaned) storage or shipping packages. In many cases it is delivered into these directly from the pasteurizer, and allowed to cool in the tightly-bunged casks.

Wines of sufficient age, that have ceased to deposit sediment and are bottle-ripe, may be pasteurized in the bottles themselves, in a water-bath



having the proper temperature. This is the preferred practice in the case of high-class wines.

The temperature must be carefully guarded, since if it either rises too high or continues too long even at its proper point, the wine may acquire a "cooked" taste, and may lose its natural bouquet. Immediately after the operation the wine is somewhat flat, but in the course of a few weeks not only fully recovers its zest, but is found very much advanced toward maturity.

*The Rationale of Pasteurization.*—The effect of this process upon the wine may be thus summarized:

1. All fermentative germs, of whatever nature, are killed by the heat; the more promptly the higher the heat and the alcoholic contents of the wine. Wines poor in alcohol, and especially those containing a remnant of sugar, require a higher temperature than those fully fermented out and rich in alcohol.

2. Acids present in the wine are, under the influence of the heating, partly neutralized by entering into combinations (ethers) which form part of the flavors of older wines, hence acetified wines become of milder taste at once, and even milk-sour ones gradually lose their "scratchiness," if not too far gone.

3. Wines while maturing in the cask are always found more or less impregnated with atmospheric air (oxygen), the gradual absorption of which forms a most essential part of the maturing process. After pasteurizing, the wine is found free from oxygen, proving that it has been absorbed during the process, thus often accomplishing, in a short space of time, an advance toward maturity that at the ordinary temperatures would have required several months.

4. When the heat is raised sufficiently high (to about  $160^{\circ}$ , which can be done without injury for common wines), the unstable "albuminoid" substances of new wines, that continue to cause the formation of deposits of lees for one or even two years after the completion of the vinous fermentation, are at once rendered insoluble, and thereafter cease to give trouble; the wine, after having been cleared by settling or filtration, forms no more deposits, and can, if necessary, be bottled.

It should be understood that while pasteurization generally puts an end to all further fermentation, it does not interfere in the least with the ordinary process of maturing in the cask. But, save in cases of emergency, it must not be practiced before the completion of the after-fermentation.

Should a wine, however, be found to be "going wrong" while the after-fermentation is progressing, it may be pasteurized to stop further damage, and will then be ready to be started on a healthy after-fermentation the following season, or sooner if the materials (*e. g.*, condensed must) are at hand.

Pasteurization thus stands in lieu of any and all *antiseptics* heretofore used in the wine itself; it should replace sulphuring no less than salicylic acid. Of course, sulphuring will always be eminently useful in the cleansing or disinfection of caskage, and remains indispensable in clearing the cellar of foul germs.

*Precautions Necessary to Insure Success.*—While in general a well-pasteurized wine is secure against further action of the ferment germs previously contained in it, it is, like any other wine, subject to reinfection from foul packages, bungs, pumps, hose, etc., as well as from im-

pure water and air. Impure water used in rinsing packages is a fruitful source of trouble, and the bottling of wine in close, musty, unventilated, and unsulphured cellars is responsible for many bottles of damaged wine, especially if the corks used have not been scalded in hot water. From want of these reasonable precautions it has often been reported that pasteurizing is not the universal cure for wine diseases that, with proper care, it has in most cases proved to be.

*The Practice of Pasteurizing.*—Among a score of varied appliances brought forward by different inventors, a few only have gained wide acceptance. For California practice the "intermittent" patterns will hardly be considered. Of those intended for continuous operation, which alone are adapted for large-scale practice, there are essentially two types. In one (including the "œnotherms" of Terrel des Chènes of Houdart and of Carpené) the cold wine passes through one or several metallic (block-tin or copper-tinned) pipes immersed in water heated by proper furnaces or by steam; in the other the pipes are replaced by a ring-shaped space between an inner and outer cylinder. The former system has, on the whole, been more generally accepted.

As has been stated above, the overheating of any portion of the wine must be carefully avoided. Hence, the temperature of the water-bath must not greatly exceed that desired for the wine, since otherwise the outside portions would, in traversing the pipe, be heated up too high, and therefore be "cooked." (The same objection lies against heating the wine in a closed tank by means of a steam coil, as has sometimes been done.) Then again, large pipes are unsuitable, as the temperature would be taken too slowly, and as a single small pipe would reduce too much the working capacity of the apparatus, the inlet pipe is made to branch into a number of these, disposed in the form of either a ribbon or a loose bundle of coils. In Terrel's apparatus, the cooler is similarly arranged.

The pasteurizer that is now considered the most perfect, is that manufactured by Houdart, under the advice of Pasteur himself.

#### HOUDART'S APPARATUS FOR THE HEATING OF WINES.

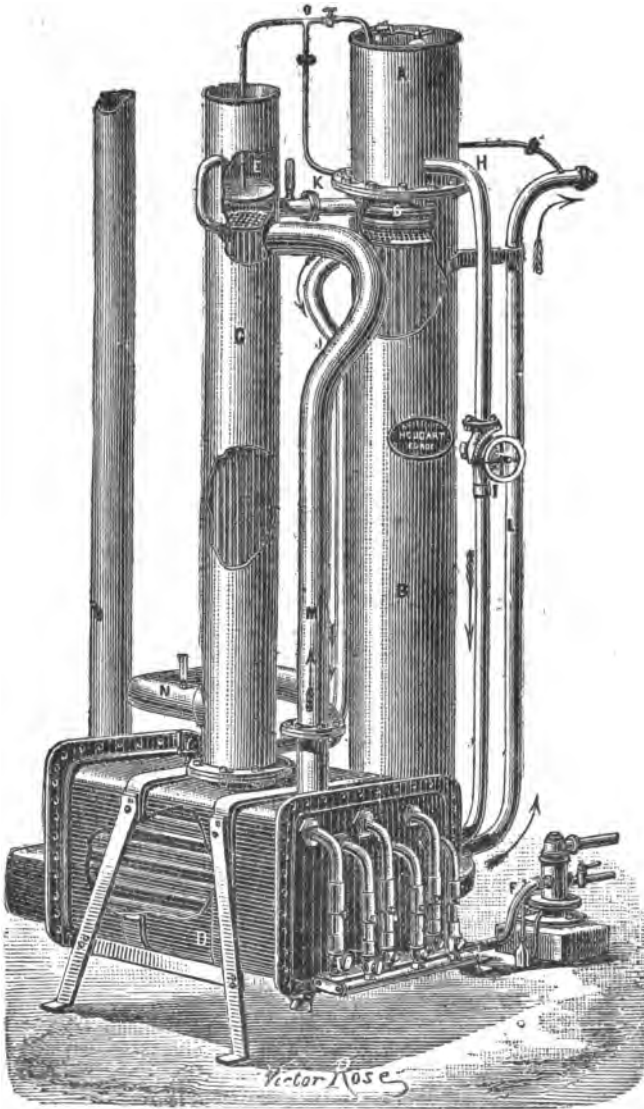
This apparatus is composed of two columns; one to heat and the other to cool the wine; the inflowing wine itself is used for the latter purpose. Beneath the heating column there is a "thermo-siphon" boiler, serving to warm the water that carries the heat to the wine as it passes through the tubes in the opposite direction.

The heating column has at its upper end a small reservoir open to the air, receiving the excess of water from the thermo-siphon.

The cooler has at its upper end a feeding reservoir into which the wine is admitted from a higher tank by means of a float-cock. Tubes connect these different parts, in such a manner as to obtain a proper circulation, and consequently, the most complete exchange of temperature possible. The passage of the wine is regulated by a graduated cock. A very sensitive automatic regulator insures a uniform and suitable temperature for the heating of the wine, by allowing the passage of only the proper quantity of gas or of steam, when once set for such temperature; thus constituting a self-regulating heating apparatus.

Thermometers placed at different points permit the verification of the working of the apparatus.

Finally, by a very good arrangement of cocks it is quite easy to empty and clean all the parts of the apparatus.



HOUDART'S AUTOMATIC PASTEURIZER.

A. Feeding reservoir of the wine, with automatic constant level. B. Cooler. C. Heating column. D. Thermo-siphon boiler. E. Water reservoir of the thermo-siphon. F. Automatic regulator of the temperature (thermostat). G. Sensitive coil of the automatic regulator. H. Pipe conducting the wine to the cooler. I. Graduated cock regulating the passage of the wine. J. Pipe going from the cooler to the heating column. K. Pipe going from the heating column to the cooler. L. Outlet pipe of the wine from the apparatus. M. Pipe conducting the water from the boiler to the heating column. N. Pipe for return of the water from the heating column to the boiler. O. Pipe receiving and returning the gases and the aromas evolved during the heating. PP. Thermometers.

*The Working of the Apparatus.*—The wine coming from the cellar at the usual temperature of about 53° to 60° F., is heated in the water-bath of the thermo-siphon boiler, out of contact with the air; attaining a temperature from 131° to 140° F. The wine moves in a continuous circulation, and in coming out of the apparatus is cooled by the wine entering it to a temperature of from 62° to 68° F.

The heating is done by gas or by steam, which is fed by a regulator worked by the outgoing wine, thus preserving a constant temperature in the heating column.

The ingoing current of the wine is regulated by a graduated cock, reading to the smallest fractions of the orifice, for the passage of the wine.

According to Houdart, the wine treated in his apparatus is preserved against the attacks of secondary fermentations, but is not aged.

A large Terrel's apparatus, with a capacity of 250 gallons per hour, costs at the factory \$240; while a Houdart's apparatus, with a capacity of about 265 gallons per hour, costs \$600, and the same with a capacity of about 790 gallons costs \$1,200 at the factory.

For ordinary purposes, however, this complex and somewhat costly construction is very commonly replaced by a single pipe forming a long coil of somewhat greater diameter than those in Terrel's apparatus; and this form, being easily constructed by any plumber, is sufficiently well adapted to the needs of small producers.

However, the latter may be benefited by using Carpené's "œnotherms," which while being simple and very good for the purpose, are low-priced. They are made of several sizes, and even with special arrangements to heat the wine in the casks themselves, and their capacity varies from 132 to 3,960 gallons, or thereabouts, per day of ten hours. Their cost varies from about \$22 to \$60. In general, quite satisfactory results have been obtained by the use of these œnotherms, and even in a recent report of Professor Passerini, Director of the Agricultural School at Scandicci, Italy, we note that since he is using Carpené's œnotherm for the heating of the wines in his cellar, they have kept remarkably well; while before the application of pasteurization it was impossible to keep such wines longer than the spring or summer seasons, for they were badly attacked by the filiform ferment of the lactic and tartaric fermentations. We must add that Professor Passerini uses the œnotherms by direct heat, which is the simplest and the least perfect so far made, and that even with this he obtained such good results.

The pasteurizer in use at the viticultural laboratory of the University of California Experiment Station has a coil of  $\frac{1}{4}$ -inch block-tin pipe, 30 feet long, immersed in a 15-gallon boiler; a 20-foot coil of the same pipe forms the cooler. The capacity of this single pipe is 8 to 10 gallons per hour when the tank water is kept at about 160°; with ten similar tubes and a bath temperature of 170° (which is admissible for some wines), in a 100-gallon boiler, the hourly capacity would be over 100 gallons, or say 1,000 gallons in ten hours.

In order that any of these appliances may work with perfect regularity it is best that the wine should descend by gravity from a supply cask, adjusted once for all to such a height above the heater as to form a proper pressure column; into this supply cask the wine to be treated is pumped as needed. Pumping the wine directly into the heater is objectionable because of the spasmodic action, by which some portions

of the wine may escape adequate heating, while others are overheated. For the regulation of the flow to the exact temperature desired, a faucet (tinned inside) is interposed between the cask and the heater; it is convenient to have another placed between the heater and the cooler, or the receiving cask. The inlet pipe must descend to the bottom of the heater, so that the wine moves *upward* in the spiral; otherwise, accumulation of gas bubbles causes irregularities. When a cooler is used, fuel may be saved by using it, instead of water, the wine that is to be heated, and may thus be given a part of its increase of temperature.

It will thus be seen that pasteurizing is a simple operation, which can be performed by any intelligent laborer who can read a thermometer and adjust a faucet.

*Utility of Pasteurization.*—When it is considered to how great an extent the general use of the pasteurizing process can do away with the most serious difficulties under which California wine-makers labor, its importance can hardly be overestimated. Our hot vintage season and the imperfect methods of fermentation still practiced in certain districts, render our wines peculiarly liable to the introduction of noxious germs, which develop so soon as the after-fermentation is completed, if not sooner. Pasteurizing will put, in most cases, a final stop to these dangers, provided proper care and cleanliness are used in handling them afterward.

It is the common practice to ship our wines when very young, and they go to long distances and pass through great alternations of temperature. Once pasteurized, they will stand this treatment without material danger or deterioration. If given rest for some weeks after the process, they may be fined, if necessary, and will arrive nearly as clear as when they left the shipper.

One of the most serious sources of complaint against California wines in the East is that they "will not keep," the cause being very generally the fact that, being too young to be bottled like imported wines of greater age, they undergo abnormal fermentation in the bottles, as they still contain germ food, and possibly germs of all kinds. All this may be largely avoided by pasteurizing, without the need of salicylic acid and without injury to the wine.

We must add that the pasteurization of wines, while simple in itself, requires the greatest care in order to insure success without causing the wine to acquire a cooked taste, which would greatly damage its commercial value.

Experience of many years has shown that while the application of heat in the conservation of the wines may in general be considered as a success, still there remain some isolated cases, and sometimes in the wines of hot countries numerous ones, in which unsuccessful treatments are reported. The causes of such want of success are still to be fully elucidated; we know, however, that some of those unsuccessful cases are mainly due to the lack of care that is given in pasteurizing, and also to the poor manipulations which follow it in some of the cellars. On the other hand we believe that some of these failures are due to the fact that certain kinds of germs, and especially the tartaric and the lactic, which develop with greater vigor and to a greater extent in the wines of warm countries, are not killed at the temperature of 150°, but require a higher one. Moreover, the latest investigations by Gautier and Bordas, on the wines of southern France and of Algeria, suggest the presence

in the wine, of germs as yet unknown, but which grow rapidly during the fermentation of the must, developing a disease similar to those due to the tartaric and lactic ferments, but distinct from them. This question has not as yet been thoroughly enough investigated to understand their nature; but there are good reasons to believe that such new germs exist, and have been observed so far only in wines produced in warm countries. It is, furthermore, quite likely that the standard temperature of the pasteurization has no effect on them, and therefore, so far as they are concerned, this operation is unsuccessful. Then, as such wines acquire a character somewhat similar to that of those attacked by tartaric and lactic ferments, we may easily, incorrectly, conclude that pasteurization has no effect on such ferments; but there are some special characters in which they differ.

The partial want of success we have experienced in pasteurizing California wines may be due to the same cause, as well as to the incomplete precipitation of the albuminoids by pasteurization, which thus presents a field always favorable to the development of the same ferments in the wine, that may occur either by the introduction of germs by later manipulations, or by the development of a few remaining in the wine after pasteurization. We say "a few," for each of several factors contribute to success in pasteurization. Thus, the age of the ferments, the conditions under which they were before treatment, the influences undergone by their ancestors, may have a marked action on certain individuals in regard to their resistance to a more or less high temperature.

In conclusion, it may be said that while the principles enunciated by Pasteur must be considered very valuable, we need yet a means of rendering them applicable to *all* cases of wine diseases; that is to say, we need a new apparatus by which complete success may be easily obtained, or at least one that may be successfully used for those special cases that are found in the wines of warm countries. But until such an apparatus is invented, those already made should be freely used, for with them we can, *in most cases*, prevent by early use, and cure the ordinary diseases of wines. In Algeria, in southern Europe, but especially in southern France, cellars without a pasteurizer are rare; and we hope that California wine-makers will imitate these countries in that respect. Nine tenths of our wines would lose nothing by that treatment, assertions made to the contrary notwithstanding; on the contrary, they will acquire a better reputation for keeping, and a larger trade, the greatest present need of the wine industry of California.

## STERILIZATION OF WINES BY FILTRATION THROUGH "CHAMBERLAND CANDLES."

Since the investigations of Pasteur, Koch, Chantamesse, Vidal, and others, on the subject of microbes, many attempts have been made to purify the liquids that contain them and are destined for human consumption. Dr. Chamberland has invented a method of filtration (for water more particularly) through a very porous kind of porcelain, and with the candles, or "bougies," of his manufacture, excellent results have been obtained.

It has been thought that this same system might be applied to wine, and especially to "sick wine," to rid it of noxious ferments, the germs of the parasites which affect it and are the cause of so many different diseases, acetification, bitterness, milk-sourness, etc. In this regard certain wines offer a wide field for study, and there has been no lack of experiments. For some time past the filtration of wine by the Chamberland method has extended to the purification of wines, besides the purification of water, for which purpose it was first used. It is in Algeria, where, on account of the warm climate, the wines are more susceptible to the various ills, that this method has been put to serious use.

Through the kindness of Mr. Catta, Chief of the Syndicate of Algerian vine-growers, we are able to give here some information in regard to this matter; the descriptions and illustrations given below are extracted from his pamphlet on the subject.

Chamberland's "bougies" are small cylinders of porous porcelain, which are closed below and open on top. If we plunge this cylinder into a liquid, the latter will tend to enter the interior cavity by traversing the pores of the porcelain; but the pores being very fine, the penetration will be extremely slow. To make the liquid pass more quickly, it is necessary to exert pressure on it, or to exhaust the air inside of the cylinder, which will bring about the same result. This object is attained by means of a siphon. If we fix a Chamberland "bougie" on the short end of a siphon and then plunge the "bougie" thus connected into a vessel containing a liquid, we have simply to suck the long end, as is done with an ordinary siphon, and soon the liquid will commence to run, the only difference being that the movement will be slower than if the "bougie" were not there. Several "bougies" can be attached to the siphon, and it will then form what is called a "battery." It is through an apparatus of this kind, which may be indefinitely enlarged, that the wine to be purified passes, and is cleansed of the ferments it contains.

The above points are well shown by the illustrations of Figs. 1 and 2. The latter shows the modification which allows the liquid to run more quickly. Instead of a single "bougie" there are five, which are fixed on the same collector *C*, connecting with the long end *E*, *K*, *T* of the siphon. The piece *K* of the siphon shows the modification that may be adopted to exhaust the air without the use of the mouth.

Fig. 3 shows a view of the apparatus in operation at the "filtrerie" of Algiers. The metallic box *H* is so drawn as to show the inside arrangement of a battery. The collectors *c, c, c* are connected with the main collector *C*, and by means of it the wine is conducted to the tube *T*, which constitutes the long end of the siphon. The wine arriving at the box *H*, as we will see later, is thus siphoned and filtered through the "bougies" shown in the cut, and afterwards it is conducted by means of the pipe *X* to the ground floor of the "filtrerie."

On the left of the illustration of Fig. 3 we see another similar box hermetically closed, as it is when the apparatus is in operation.

The following explains how the work is done at the "filtrerie" of Algiers:

The wine to be sterilized arrives either by rail or by wagons, on the platform fronting the building. The casks are taken, by a powerful elevator, to the higher floors of the building. The wine is racked into reservoirs placed in the highest part of the "filtration room," as may be seen in Fig. 3.

From these reservoirs the wine passes, by its own weight, into a coarse filter *B*. At one side is the box *F*, which contains a float-cock to maintain a constant level in the coarse filter, which consists of screens covered with filtering cloth, through which the wine passes, and comes out by the pipe *E*, leaving on the cloth the thicker lees, that would too quickly choke the "bougies" and retard their action. The pipe *E* brings the wine that has undergone this first clarification, to a box *G*, the purpose of which is to maintain a constant level in the filtration boxes *H*. It constitutes the regulator of the level, which purpose is attained by means of a lenticular float-gauge valve placed at the center of the box *G*, and which closes as soon as the surface of the wine reaches a certain point, and opens again as soon as the level falls and admits more of the wine coming from the coarse filter. It should be well understood that the box *G*, as well as all the other parts of the apparatus, are hermetically closed during their working, so the wine remains constantly out of contact with the air, being, by special arrangements, covered with an atmosphere of carbonic gas. Notwithstanding the larger number of parts of the apparatus which remain in contact with the wine, it is not in any way altered, for they are made of pure tin, or of silver, or at least they are lined with a varnish which is completely insoluble, and which consists of a kind of enamel not attacked by ingredients of the wine.

The pipe *Z*, which receives the wine coming out from the box *G*, passes along all the filtration boxes with batteries, and feeds each one of them with the wine; a cock not seen in the figure, permits one to cut out any box, which can be done without interfering with the work of the rest.

The wine thus filtered and sterilized by the batteries goes out by the tubes *T*, which are all connected with the same descending pipe *X*, by which the filtered wine is conducted to the lower floor.

In order that the siphon, which constitutes the essential part of the "filtrerie," may work easily, it is necessary to maintain on the wine in the boxes a pressure equal to that of the atmosphere, otherwise, so soon as a portion of the liquid has been siphoned the run would stop, just as would happen in attempting to empty a cask without taking out the bung. This is the way the pressure is maintained: The box *G* regulates the level so that in none of the filter boxes does it become as high as the collectors *c, c, c*. The space between this level and the cover of the



boxes is filled with carbonic acid gas, produced by an ordinary generator. The gas is introduced by a compression pump into the system of pipes *Y*, the vertical branches of which distribute it to all the boxes. At the time of starting the operation care is taken as to first fill all the boxes with carbonic gas, then the wine is allowed to run in, and at the same time the gas is compressed on its surface, and the air is exhausted inside of the candles by means of an air-pump, which communicates with them by means of the small arrangement that is seen above the cock *P*. All this being done, the apparatus is automatic, maintaining the pressure of the carbonic acid gas by regulating its entrance. The descending tube *T*, being made of glass, permits an easy control of the work.

After a certain time, notwithstanding the preliminary action of the coarse filter, it becomes necessary to clean one or several parts of the apparatus. This is done in the following manner: By aid of a cock (not shown in the figure), the box *H* to be cleaned is cut off from the rest of the apparatus. After having removed the cover, the wine still in the box is drawn off by the pipe *N*, to the horizontal pipe *S*. This is done by unscrewing the plug that closes the upper end of the pipe *N*. There is a similar arrangement in the regulating box *G*, behind the float-valve.

It does not, however, suffice to empty the boxes only. The wine remaining in the candles must now be drawn off in order not to mix it with the wine of the later operations. It is done as follows: The pipe *Y*, which served to bring the carbonic gas, is placed temporarily in communication with a pump which compresses the gas and sends it to the inside of the "bougies;" the cock *P*, being shut, the wine which remains in the cavities of the "bougies" is forced to pass, in a reverse direction, through the pores of the porcelain, and this reverse passage serves to detach the deposit formed on the outside of the "bougies." This connection is made by means of a three-way cock (not visible in Fig. 3) at the end of the branch of the pipe *Y*. This cock, turned in a certain direction, establishes communication between the pipe and the general cavity of the box, thus admitting the carbonic gas during the filtration; turned in the reverse way, it establishes communication between the pipe and the cavities of the "bougies," and then the gas is forced into these cavities for the cleaning of the "bougies."

When all the turbid wine has been taken out by the tube *N*, the apparatus is thoroughly washed with clear water in order to take away the solid deposits, the lees, and everything is replaced in a good condition ready to start to work again. The final washing is done by means of a special pipe not shown in Fig. 3, which brings the water under pressure over each part, and being directed by the hand. It has a three-jet nozzle and completes the cleaning. The rinsing water is finally drawn off by the pipes *h* and *O* in the same manner that the wine was taken out by the pipe *S*. The box or battery is then ready to work again.

Each of the boxes in the "filtrerie" of Algiers contains a battery of five hundred candles, and as there are twelve boxes the number of candles is six thousand. The total length of the descending pipes and of their collectors, calculated on the same vertical line from the level of the wine in the boxes to the opening of the descending pipe in the ground floor of the building, is four meters, or about thirteen feet.

By previous experiments made with both water and wine it was

known that the quantity of water that passes through a Chamberland candle during one hour, when the fall is one meter (39.4 inches), is of one third of a liter, or of about a quart. In case of wine, and under the same conditions, only one tenth of a liter, passes. Therefore, taking into account the fall of four meters and the six thousand candles, the filtrerie of Algiers should filter six hundred and seventy-six hectoliters (of about twenty-six gallons each) every twenty-four hours. In practice, however, they filter from three to four hundred hectoliters per day, or from about eight to ten thousand gallons.

The wine thus treated is conducted by means of the descending pipe, X, to the ground-floor of the building, where it flows into a large closed vat, from which it passes into the same barrels that brought it to the filtrerie. These barrels are sterilized by steam during the time the wine is filtered.

When thus treated and put in casks, the wine is said to be rendered safe from all deterioration as long as fresh germs of maladies are not allowed to enter it, or are introduced in subsequent rackings and manipulations. It is possible, then, to leave such wine in a badly exposed place or ship it to long distances, without risk of its becoming acetified, bitter, or milk-sour, and when it arrives at its destination it can compete honorably with well-made and sound wines.

Mr. Catta reports that having filtered, in his laboratory, part of a wine infested with the filiform ferment, he submitted it to one of the most experienced experts of Algeria, together with another sample of the same wine not filtered, without, however, giving him any explanation, simply asking him what might be the difference in commerce between the two samples. Without the slightest hesitation, and without suspecting for a moment that he was dealing with the same wine, the expert pronounced the filtered wine to be worth at least five francs more per hectoliter than the other; so much difference was there in limpidity and brilliancy of color. Finally, Mr. Catta states that by the different experiments made in his laboratory with the filtration of wines through the Chamberland candles, not only complete sterilization of the wine was obtained, but its chemical constitution was not changed. Several comparative analyses of the wines before and after treatment showed no change in it; on the contrary, the color became more brilliant.

Mr. Catta's last statements do not, however, agree with the opinions that other investigators have formed in regard to this matter.

Aside from the fact that the Chamberland candles may more or less completely free the wine of the germs infecting it, the filtration through them is not the same as that obtained in ordinary filters. This has been observed from experiments by Mr. Boidin, Chemist of the Central Distillery, Séclin, France, and by Professor Grazzi-Soncini, Director of the Royal School of Viticulture and Oenology, Alba, Italy.

Mr. Boidin has observed that the must of corn, saccharified with 13 per cent of green malt, becomes, while filtering in the Chamberland candles and around them, more turbid and produces a syrupy layer, very gelatinous, which dissolves in water, and when treated with iodine shows the red coloration of dextrin, a coloration that was not obtained before starting the filtration.

A solution of maltose filtered through paper contained:

|                         |              |
|-------------------------|--------------|
| Dextrin .....           | 2.40 grams.  |
| Maltose in 100 cc. .... | 12.09 grams. |





The proportion of maltose to dextrin was of 84 of maltose to 16 of dextrin.

The same solution after filtration through the candles contained:

|                        |              |
|------------------------|--------------|
| Maltose in 100 cc..... | 12.09 grams. |
| Dextrin .....          | 1.51 grams.  |

Or in the proportion of 88.8 of maltose to 11 of dextrin.

Mr. Boidin, by analogous experiments for the albuminoids and mineral matter, has found that the albumin passed through the candles was four tenths the weight of that passed through the paper filter; and the mineral matter was .075 grams in the solution through the candles, and .155 grains in that filtered through paper. In the latter respect about similar results were obtained by Professor Grazzi-Soncini, who having made also another experiment upon a three-year-old white wine, attacked by the acetic ferment, came to the conclusion that the wine filtered through the candles shows, after the operation, a diminution in the quantity of extract; but after a certain time that quantity becomes relatively higher by the simple fact of the diminution of that of the wine passed through only an ordinary filter (such as Wolmar's), and which is due to the defecation during the aging of the wine itself. Professor Grazzi-Soncini found by microscopical examination that the unfiltered wine contained a large amount of ferments; the wine filtered through the Wolmar filter showed only a few of them, while in that passed through the Chamberland candles the ferments had entirely disappeared.

Professor Comboni, of the Viticultural School of Conegliano, thinks that the Chamberland candles act in part for the wine as dialysers, and that the diminution of ash is intimately connected with the diminution of colloidal substances (not dialysable), with which is chemically combined a certain quantity of mineral matters. It is well known that the substances that do not crystallize, pass only a little or not at all through membranes, and the Chamberland candles would act both as filter and as dialyser membranes.

There are at this time three public "filtreries" in operation at Algiers, Oran, and Philippeville, and as they are somewhat costly and complicated, they have not been established in any other countries.

Besides this obstacle there is always the doubt that it may not, under all circumstances, have the power of sterilizing the wine; that is to say, experiments have shown, that when the candles are well made in regard to composition and degree of baking, they have such power, but when they are not of the same composition and are not baked to the right degree, they may not sterilize the liquids. It is not universally admitted that water passed through the Chamberland candles is always free from the germs of contagious diseases; it is right to say, however, that the fault is not due to the Chamberland method, but only to the faulty preparation of the candles.

As far as we know it seems that there has been a lack of systematic experiments upon the application of the Chamberland candles to the filtration of sick wines; and this we think is principally due to the lack of candles in the trade that would give satisfactory results. We obtained some time ago three Chamberland candles, but in order to be able to make good experiments in the University cellar, we would prefer to work with a battery composed at least of two or three dozen

candles; we ordered them from France, and after some time we were informed that new candles were being made, and that they could only be obtained after several months. We are still waiting for them.

In conclusion, we may say that if the candles can be made always with the exact degree of porosity that the Chamberland method requires, and if small, cheap, and practical batteries can be made for use in the wine cellars, this method will doubtless have the preference over others; for besides curing the sick wines it saves cost in their filtration. But as things now stand, pasteurization is still generally preferred, though not always giving wholly satisfactory results.

## APPLICATION OF ELECTRICITY IN THE AGING AND CONSERVATION OF WINES.

Notwithstanding the numerous experiments made in regard to the action of electricity on wines, we cannot as yet say that the wine industry has been benefited by it. Some good effects have, however, been already obtained, at least in medium-class wines. We shall here review the conclusions of the several investigators.

About twenty years ago, Scoutteten, after numerous experiments concluded that electricity applied in any form would act uniformly on wines, resulting in their improvement and aging. Dr. Hull, of London, after other experiments recommended the electrifying of wines, in order to increase their bouquet and diminish their acidity.

As early as 1871, Professor Carpené, of Conegliano, Italy, after careful experiments on the same subject, came to the following conclusions:

1. An electrified wine keeps for a longer time.
2. It acquires the characters of an old wine, in losing some of its color and albuminoids; but these characters are especially perceived by the ethereal odor that it assumes.
3. This ethereal odor is the same in all electrified wines, whatever their nature, either white or red, except wines from aromatic grapes like the Muscats; this equality of the perfume is unsuitable, for it mixes the different types of wines.
4. This perfume, while agreeable, is not homogeneous with that of the wine, for it seems to have been added artificially, and at the end provokes a certain disgust, although present in very small proportions.
5. Under the action of the electric current the wine does not become richer in alcohol; on the contrary, there is a small loss of it by evaporation, as it is carried out by the gases evolved during the electrolysis of water.

Professor Carpené in the year 1890, having had an opportunity to speak again on this subject, adds that after numerous experiments he has always considered the electrifying of wine as an operation of little importance, and that it is not worthy of further attention on the part of investigators. He thinks that the latter should look more towards the solution of rational methods of vinification than to the application of electricity to wines. Moreover, he justifies his assertion against the use of electricity in the improvement and the aging of the wine by the fact that all wines treated acquire the same bouquet, and therefore destroys the different types and individuality of wine. He also discusses the well-known fact that as all liquids offer a certain resistance to the passage of the electric current, if the latter does not overcome that resistance, the electricity will have no action; and if it does overcome it, as in the case of wine which is a rather good conductor, it produces by its passage, electrolytic phenomena; that is to say, decompositions which alter the constituents of the wine, disturbing their equilibrium.

It will be noted that Professor Carpené's remarks refer especially to

the impropriety of treating sound wines in order to improve, preserve, and age them. But it seems proven that when electricity is properly applied to sick wines it will cure the disease, but as yet there is no proper method for its application, and, therefore, even in the treatment of wine diseases many unsuccessful results are reported.

In 1885 Mr. F. Mengarini, of Rome, undertook a series of careful experiments on this same subject, and after numerous trials he came to the conclusion that electric treatment of wines is of great importance for all those that must be shipped to long distances, and that under ordinary conditions could not be shipped without being filtered, heated, or fortified beforehand. According to him, electric treatment would have the advantage over the above three operations, which cause the deposition of the substances in suspension in the wine, which substances remain sterilized and inactive in the wine in such a manner that it might be shipped even when cloudy or turbid, and be racked only at the place of arrival.

In a letter just received from Mr. Mengarini, to whom we had addressed an inquiry in regard to his final opinion on the electric treatment of wines, we note that, after having experimented by all methods, and with electrolysis alone (which is the least energetic of the oxydizing agents), on different wines, and under different conditions, he comes to the conclusion that the supposed rapid aging is an illusion. It is true that the wine defecates rapidly, and tends to a lighter color, but the current, if somewhat strong, or if acting for about an hour or so, gives to the wine a disagreeable taste of ozone, which is easily recognized. He adds that he has found in the electric current a very powerful means for sterilizing the wine, but he thinks that, as now, we have so many simpler and easier means for attaining the same object, it is not, at least for the present, and with the means now at our disposal, either useful or practical to apply the current to sound and good wines; and therefore he concludes that it would not be worth while to insist any further on such experiments. But he proposes a new process for curing "pricked" (acetous-tainted) wines, and for the purification of alcohols by electricity, about which we will give some information below.

#### TREATMENT OF WINE BY ELECTRIC INDUCTION.

In the year 1886 Dr. E. J. Fraser, of San Francisco, California, proposed a new process for maturing wines and liquors rapidly, by placing them in the magnetic field. The process, and the apparatus for working it, were patented in the United States and in all the wine-producing countries of Europe.

The first definite, quantitative investigations on this process are set forth in the subjoined report, made in 1887, by Professor Hilgard:

UNIVERSITY OF CALIFORNIA, COLLEGE OF AGRICULTURE,  
BERKELEY, March 7, 1887.

For some months past experiments on the process of maturing wines rapidly in the electro-magnetic field, as proposed by Dr. Fraser, of San Francisco, have been carried on in the Viticultural Laboratory of the University. The wines submitted to the treatment were mostly made in the laboratory itself, and therefore, positively known to be pure. The process was carried on in three-gallon glass jars, sealed with paraffine, and around which there was a double coil of insulated copper wire, through which a current of from one-quarter to one-half ampère, generated by a constant battery, was circulated. To this influence the wine within the jars was exposed from three to six weeks at a



time. The wine was analyzed at the outset, and samples of the same were kept in glass outside of the electro-treatment for comparison, both by taste and analysis.

The results are given in the appended table (p. 294), and may be thus summarized:

The wine under treatment did not seem to deposit either more or less sediment than the sample left outside untreated; and there seemed not to be, at any time, an appreciable difference as to the clearness of the treated and untreated samples. Each time, after the second week, a notable difference in the "smoothness" of the samples on the palate began to manifest itself; it was always unmistakable after the third week, and the difference seemed to increase, at least, up to the fifth week. A comparison by taste indicated in every case a decrease of acidity, and a more pleasant character of the acid, and the bouquet of a very much more mature wine became apparent.

Analysis of the treated wines shows, almost throughout, the following facts: A slight decrease of both acid and alcohol, indicating that a combination of the two into ethers had occurred, as in the natural maturing process. No appreciable change in tannin; very little in color.

It thus appears that at least one of the processes that characterizes the usual process of maturing is very greatly hastened by the electro-magnetic treatment, and that an unmistakable improvement of the wine on the palate takes place. Whether the wine so treated is to be considered as similarly advanced in all other respects, remains to be determined by further experiments. But to the extent to which action has occurred, that action may be considered as permanent.

E. W. HILGARD.



In July, 1891, Professor Hilgard, in reply to inquiries addressed to him from abroad regarding this experience with the electro-magnetic process, wrote as follows:

The *modus operandi* first employed by the inventor was a battery current, of  $\frac{1}{4}$  ampere or less, passed around glass jars holding about three gallons. At least this was the arrangement with which my own experiments were made, and these were measurably successful. The wine acquired an unmistakable increase of "age" in the course of three weeks' treatment. Moreover, it acquires remarkable keeping qualities, in resisting exposure to air without perceptible acetification, much longer than any untreated wine.

Analysis of the treated wine showed in nearly every case a slight diminution of acid, hardly perceptible to the taste, but quantitatively determinable without difficulty. My inference was and still is that the induction was instrumental in combining into aromatic ethers some of the acids and alcohols of the wine, as also happens in the aging process as usually conducted. As to the keeping qualities, the natural inference was that the magnetic influence destroyed the various active germs in the wine, but it might also be held that it renders their food unassimilable. I found, however, that the total nitrogen contents of the wine were not decreased; what changes might have happened as regards the albuminoid substances themselves is a complex question, not easily solved.

The inventor then organized the "Purity Wine Co.," which treated wines in tanks about ten feet high and three in diameter, wrapped outside with a single coil of wire carrying an indefinite current from a dynamo; but this treatment failed to give uniformly satisfactory results, as might be expected, and was largely applied to "sick wines."

Dr. Fraser then changed his plan and finally came down to passing the wine through a narrow tube wrapped with a triple coil carrying a current of 10 amperes or more, thus hoping to save time. This apparatus was finally transferred to the Experiment Station of the University, and we tried it thoroughly and found it an utter failure. The treatment improved neither the taste of the wine nor its keeping qualities; on the contrary, made it flat and useless.

I then told Dr. Fraser he would have to come back to weaker currents and longer time, with which he had obtained his original good results, of which I still retain corroborative samples.

My judgment is that the "induction process," when properly applied, will give good results in imparting extraordinary keeping qualities to the wines treated; for such have been obtained, and of course can be obtained again. As to the aging, it is most efficient and striking in sweet fortified wines; less satisfactory in dry wines of high bouquet, which seem to lose their special characters, in measure, and assume a somewhat peculiar aroma—at least such was the case in the wine treated by the Purity Wine Co.—which, however, is agreeable, and is only perceived by experts as different from what the wine should have. It is natural enough to suppose that the compounds formed under the influence of electric induction are different from those formed when wine is aged in the ordinary way. The process would not, according to my ideas, be applied to wines of high value for their natural bouquet; but would be extremely serviceable in the middle class of wines.

It should be added that experiments with this process at the Experiment Station laboratory have been discontinued, simply because it was found that their further prosecution requires a better command of steady and reliable electric power than is now at our disposal. They will be resumed whenever this difficulty is overcome.

#### MENGARINI'S APPARATUS FOR THE TREATMENT OF ACETIFIED WINES.

Towards the end of 1889 Mr. Mengarini, desiring to undertake new studies on the action of electricity applied to sick wines, observed that when in an acetified wine the negative electrode of a direct current is allowed to act, the taste of the wine changes gradually, and the excess of acidity decreases to an extent very perceptible to the palate. On the contrary, when the wine is submitted to the electrolysis with the two poles very near each other, and developing at the same time hydrogen and oxygen, the acidity increases, and acetic ether is rapidly formed. This fact led Mengarini to think it would have been possible to utilize the strong reducing power of the hydrogen developed by electrolysis to reduce the acid produced by the acetic fermentation of the wine.

After several experiments in the premises Mengarini came to the following conclusions:

1. To obtain the complete dis-acetification it is necessary to produce such a development of hydrogen, that besides reducing the acetic acid it must paralyze temporarily the activity of ferments.

2. That the result will be retarded and incomplete if the operation is effected in contact with the air.

3. That when the desired effect has been obtained, if the wine is left to itself, it tends to acetify again rapidly.

Other experiments made by Mr. Tolomei, on the general action of electricity upon acetic fermentation, agree with the third of the above statements of Mengarini; in the sense that the electric current has no direct influence on the acetic germ (*Mycoderma aceti*), though it can stop or prevent its development for the time, but when the current is arrested the acetic fermentation again takes its normal development.

The above partial conclusions indicated that the treatment should be made in a perfectly closed apparatus, and that as soon as the treatment is completed the wine must be separated from the acetic ferments that it still contains.

Following these results it was necessary to determine whether the decrease of acidity was a fact and could be quantitatively appreciated, and if it would occur also when a large quantity of wine was treated.

Mengarini therefore experimented with a solution of acetic acid, that at the time of analysis showed 20.19 pro mille of acidity; after four hours of treatment it showed 19.756 pro mille; and after twenty-eight hours, 16.72, that is to say a loss of 3.47 pro mille of acidity.

A red wine that had remained in an open bottle for several days in the laboratory, and that had an acidity of 30 pro mille, after being treated strongly for thirty-three hours, the acidity was reduced to 17 pro mille.

Several other experiments on the same line were made by Mr. Mengarini, and the results were so satisfactory that he went on to construct an industrial apparatus that in a simple and economic manner could produce the electrolysis in a considerable quantity of wine, maintaining the separate development of the oxygen and of the hydrogen.

This apparatus, which is now already used to a certain extent in Italy, consists of an enameled earthen vessel with a capacity of one hectoliter (about 26 gallons), having on its bottom a disk of compressed carbon 30 centimeters (about a foot) in diameter. The disk communicates with the outside conductor by means of a cylindrical carbon one centimeter in diameter, lined on its outside with a tube of glass fixed with paraffine, in order to prevent the development of the hydrogen on the carbon conductor. The mouth of the vessel is narrow on one side, leaving open an eccentric circle 4 centimeters smaller than the diameter of the vessel, in which is introduced an empty cylinder made also of earthenware. The lower end of the latter is tightly closed with a sheet of parchment paper (which prevents the giving off of oxygen in the wine), and contains another disk of carbon arranged like the first one. The upper part of the cylinder has a wooden cover with a hole in its center, in which is placed a binding-screw to secure the carbon. The cylinder is tightened and kept in place by means of a wooden circle divided into three parts, and connected by thumb-screws. This circle, when the cylinder enters the vessel, closes it, and serves also to regulate the immersion.

In working the apparatus, the vessel is filled with the "pricked" wine, then the cylinder with the disk of carbon is introduced in it until

the parchment reaches the surface of the liquid; a small quantity of alcoholized water is poured into the cylinder, in order to establish the contact between the parchment and the carbon, and the current is turned on, gauging its intensity by an ampèrometer. The current should never be below 0.040 ampères, but kept between 0.045 and 0.052 ampères. These limits have been suggested by the experiments so far made, and it is natural enough to think that they are neither absolute nor definite. Experience will indicate whether they should be enlarged or diminished. The negative pole, that is that which develops hydrogen, is formed by the disk placed at the bottom of the vessel; the positive pole is formed by that fixed in the cylinder; in such manner the mass of the wine is traversed by an ascending current of hydrogen, and is not in contact with the oxygen, which develops in the upper cylinder and goes out through a few small holes made in the cover.

The length of time that the current should act cannot be determined *a priori*. It depends on the quantity of wine that is in the vessel, on its degree of acetification, and on the intensity of the current. Therefore, from time to time the wine should be tasted to determine the moment when it has lost the acetic taste and odor. Then it is let out through the faucet below and immediately filtered through a very thick filter strongly sulphured. If the wine before acetification was of good quality, it may be placed in the trade, with the addition of a small quantity of alcohol; if it were already of a lower class, it may be blended with a small quantity of strong wine low in acidity.

According to Mengarini, the treatment is neither difficult nor costly. Thousands of hectoliters every year are depreciated by the attacks of acetic fermentation, and when they can be rendered again good for consumption, this treatment appears of great industrial importance. Mengarini's method is the simplest and the one which answers best among those proposed for the same purpose, many of which were worthless. However, its importance should not be exaggerated so as to believe that a very fine wine becoming acetic, might again be such after the treatment; but we must only pretend to obtain wines of medium quality, and which do not smell or taste of the vinegar, which renders them unsalable.

#### MENGARINI'S PROCESS FOR THE RAPID PURIFICATION OF ALCOHOL BY MEANS OF ELECTRICITY.

The first experiments by Mr. Mengarini, in 1889, were made by direct electrolysis, immersing two platinum plates in brandy and keeping them five centimeters apart; afterwards the two poles were immersed in two different vessels connected by a large siphon-tube. In both modes of experimenting an improvement was found, which was greater with the weaker currents than with stronger ones. However, Mengarini found that the result was not sufficiently effective to be considered for industrial purposes; therefore, he tried to combine with the action of the electricity that of another agent, which could increase and complete it. Such an agent was animal charcoal.

In the second series of experiments the platinum-electrodes were replaced by those of carbon.

The apparatus invented by Mr. Mengarini for this treatment is made of wood, with a capacity of two hectoliters, and contains at the same time one hectoliter of alcohol and 100 kilos of animal charcoal. It is

perfectly closed in order to prevent evaporation, and has on the outside a gauge tube of glass, which serves to insure that the apparatus is full, and also to allow the exit of the liquid treated.

The results obtained with this apparatus have been excellent. With a brandy at 61 per cent, the total impurities, which, determined by Röse's method, were 12.072 pro mille before treatment, fell to 7.162 after treatment. Good results were also obtained with a brandy at 95. although, as is known, the purification of concentrated alcohols is more difficult.

Mr. Mengarini finds that his apparatus produces some loss, but he believes that the greater value acquired by the brandy after treatment suffices to compensate both the loss and the working expenses, and leaves still a good profit to the manufacturer.

#### COMPARISON OF WINE HEATING AND ELECTRIC TREATMENT.

In April, 1890, Mr. C. Bernardi, of Italy, publishing his results of experiments on the rapid aging of wines by heat and by electricity, came to the following conclusions:\*

1. "Pasteurizing" and the direct action of the electric current† result in a notable aging in both red and white wines.

2. Red wines under the action of electricity acquire, besides a notable aging, a delicate bouquet, provided they are kept in cask for some months after the action of the current; they become also fuller flavored and less coarse; while pasteurizing, though having in a less degree the advantages of electricity, causes a loss of flavor in some wines.

3. White wines submitted to the electric current acquire a certain degree of age, but odors and tastes are also developed in them which, though not disagreeable in themselves, might be mistaken for artificial additions, and are such that they soon pall on the palate. However, after some months of rest in cask, these odors and tastes become diminished and refined, and it is probable that with a prolonged stay in the cask they would disappear completely.

4. Pasteurization, though it ages the wine, has for white wines the disadvantage of diminishing its bouquet. It is to be preferred for white wines, as it communicates no foreign flavor to them.

5. In red and white wines treated by electricity, an identical odor is produced, being, however, much less marked and disagreeable in red than in white wines.

6. The larger quantity of ash in the electrified wines, and the smaller amount of extractive matter, should prove the elimination of albuminoids, and therefore give the wine a better chance of keeping. The keeping of the wine is due, however, also to the antiseptic qualities of the current (action of ozone).

7. The diminution of acid in the heated or electrified wines is due to the formation of ethers (which denotes age), whose presence causes the cream of tartar to be deposited.

8. The increase in alcohol which takes place in young electrified wines preserved in bottle, proves that the action of the current is not dangerous to the alcoholic ferment, which is only arrested in its activity, and regains it afterward. It would therefore be important to rack the clear wine from the ferments which form part of the lees.

\*These conclusions are reprinted from Experiment Station Bulletin No. 87.

†The intensity of the current was 7 amperes.

9. A very *weak* current of electricity must be used, and for a *long time*.

10. With an apparatus like that of Bernardi the current must be continuous for from one hundred to two hundred hours.

#### EXPERIMENTS BY OTHER INVESTIGATORS.

Other experiments were also made in 1890 on Algerian wines by De Méritens and Rivière, and their conclusions as regards the chemical changes which occur in the treated wines, agree more or less with those obtained by other investigators. However, De Méritens reports failures of the electric treatment of wines.

Experiments, principally on sick wines, were conducted by Mr. Martinotti in Italy in the year 1890. The wines that he treated were turbid wines, spoiled wines, and white wines.

The electric current to which the wines were submitted was obtained from a Bunsen's battery of four elements. After three hours' treatment the turbid wines were much clarified, and the same wines allowed to stand became completely clear after twenty-four hours.

This is the most important result that we can expect in the electric treatment of the wines. In Martinotti's experiments, treated wines as compared with untreated ones, showed lower body, a small diminution of acidity (*fire*), and an increase of the free acidity produced by the oxidation of alcohol. Their loss of alcohol was very small.

Martinotti treated also wines attacked by the filiform ferment of tartaric fermentation. They were submitted for four hours to the action of electricity, and the result was their rapid clarification and the deposit of the germs of the disease. The wines that were only at the first stage of the disease were cured, and after having been racked, remained bright, while those very badly attacked by the disease became turbid again after a few days, and the disease reappeared, but in a smaller degree. In order to obtain better results the treatment was prolonged for twenty-four hours; the results, however, were just the same, except that the clarification of the wine was obtained sooner.

After these preliminary experiments, Martinotti thought that since the disease germ alters materially the composition of the wine, the latter would still remain a favorable field to further alteration; but that perhaps the addition of certain substances that would bring the wine to its original composition, might have prevented this second attack. Then he tried the addition of tartaric acid, cream of tartar, tannin, invert sugar, but no success was obtained. After that he tried the addition of condensed must to promote fermentation in such sick wines, first temporarily sterilized by the electric current. The result of that addition was satisfactory in curing both wines attacked by tartaric and by bitter fermentations, while no success was obtained on acetified wines. It seems that the rapid and energetic development of the normal wine ferment completed the action of electricity, and killed the secondary ferments that the current had paralyzed.

Martinotti's experiments on turbid white wines showed that electrization produced a rapid clarification, and therefore the treatment may be of great value for wines destined to make sparkling wines.

According to Martinotti, when an electric current is applied to spoiled or fermenting wines, the germs that they contain, not meeting conditions favorable to their development, fall to the bottom (carrying with them

all other impurities), and remain in a latent state. But in the liquid above there remains always the germs which produce further fermentations. In treating the wine when these germs are developed, a certain amount of them is eliminated, and after three treatments the germs are in such small numbers that they cannot produce in a short time any serious fermentation. Moreover, Martinotti thinks that the action that electricity manifests on the germs is more chemical than mechanical, for having submitted wines to the action of an induction current of a large Ruhmkorff's coil, which was in communication with a Grenet's battery of sixteen elements, the results obtained were inferior to those obtained using a battery without a coil.

In wines treated by a strong current from a dynamo for about three quarters of an hour, no complete sterilization was obtained, and at the end of the treatment the wine was quite warm.

Finally, Martinotti concludes that the current should rather be constant than intense, and that its intensity must be proportional to the distance between the electrodes, to the amount of alcohol and the acidity of the wine to be treated.

The original idea of Martinotti to add condensed must to wines treated once by electricity should be taken into serious consideration, for it may be applied at least to the cure of wines attacked by bitter and tartaric fermentation which occur largely in vinification in warm countries.

Professor Tolomei, of Florence, Italy, experimented last year on the action of an induction current on the fermentation of the must, and came to the following conclusions:

1. The development of the *Saccharomyces ellipsoideus* (one of the wine yeasts) is largely prevented by the action of the electric current, and when the latter is strong enough to produce light in a dark room its development is stopped.

2. The liquid that has undergone the action of the electric current keeps well without developing any fermentation, just as if it had been boiled for some time.

3. The ferment is destroyed by a strong electric current.

#### RECORD OF WINES TREATED BY ELECTRICITY IN THE EXPERIMENT STATION LABORATORY.

Such is, at this time, a general view of what has been done in regard to electrical treatment of wines. Below are shown the results of chemical analysis and tasting of wines treated by the Fraser process at the cellars of the Purity Wine Co., and at the Viticultural Laboratory. From these data it may be easily seen that the general results obtained in the treatment are very nearly the same as those reported by other investigators, but as a rule the final results are unsatisfactory, as above already stated, on account of the improper use of the intensity of the current and the duration of the treatment. The treatment with intense currents did not improve the taste of the wine, on the contrary rendered it flat; moreover, the keeping qualities of the wine were not improved; the sterilization of the wine was not obtained, and when the treated wines were exposed to the air their acidity increased every day, more and more; for after having been attacked for a short time by the *Mycoderma vini*, they went rapidly into acetic fermentation.



In regard to its chemical composition, the treated wine as compared to the untreated one, shows, as a rule, a diminution in the amount of body, of alcohol, and of the acidity, and an increase of the volatile acids; but no appreciable difference can be reported as regards the color of the wine.

Other experiments conducted on liquid from condensed must while fermenting, showed that the electric current had no action on the fermentation; on the contrary, at first it seemed that the latter was rather increased than diminished. In this liquid, mixed from two samples that were treated from eleven to thirteen and one half hours at 10 amperes, when the treatment was stopped the fermentation went through, although somewhat slowly; and a tasting of the wine from both samples, made about one year after treatment, showed that the one treated for thirteen and one half hours was rather good, while the other treated only eleven hours, was not as clear as the other sample, and had a suspicion of lactic fermentation.

The apparatus made use of in these experiments consisted essentially of five glass tubes wrapped with three layers of insulated copper wire, through which the current passed. These tubes, which were about four feet long, each, and two inches in diameter, were so arranged that the wine ran through them in a continuous stream; the tubes were connected to each other by rubber points, and placed ziz-zag, in order to economize space.

The wines entered through a small tube of about half an inch in diameter which connected with the siphon by which the wine under treatment was drawn from the barrel. The cock at the exit was furnished with a graduated disk by which the quantity of wine passing in a given time, or, in other words, the length of time during which the wine remained subjected to the action of the current, could be accurately regulated. The exit tube was connected with a glass tube which passed to the bottom of the receiving vessel, thus avoiding, as much as possible, contact with the air after treatment.

The current was obtained from a dynamo, and passed through about one hundred yards of  $\frac{3}{16}$ -inch copper wire before reaching the tubes. The average strength of the current used was about 10 amperes.

The wines treated were Grenache, Teinturier Mâle, Chauché Noir, Black Hamburg, Chasselas de Fontainebleau, Gros Verdot of the vintage of 1888, and a blend of Pinots of the vintage of 1889. All these wines were more or less attacked, principally by lactic fermentation and some, slightly, with bitter and acetic ferments. The duration of the treatment was from one fourth of an hour to four and one half hours. Besides these samples there was another of Malvoisie of the season of 1889, that being divided into several samples, were treated for from one to twelve hours; and two samples of condensed must at different periods of fermentation were also treated from eleven to thirteen and one half hours.

The general result of these experiments has been reported above; the table of analysis and the detailed record of treatment and tasting are the following. But the analysis and record first shown are those of wines treated in 1887 at the Experiment Station laboratory in Fraser's glass jars, and with a battery current when his process first started, the results of which were printed by him in a circular:

## ANALYSIS AND EXPOSURE EXPERIMENTS OF ELECTRIFIED WINES TREATED BY THE PURITY WINE COMPANY, 1889.

| Name of Wine, Sender, or Producer.         | Description of Treatment.             | ANALYSIS. |       |           |           |        | EXPOSURE.              |          |             |             |             |
|--------------------------------------------|---------------------------------------|-----------|-------|-----------|-----------|--------|------------------------|----------|-------------|-------------|-------------|
|                                            |                                       | Body      | Sugar | Alcohol   |           | Tannin | Acid.                  |          | Nitrogen    | Albuminoids | Total Acid. |
|                                            |                                       |           |       | By Weight | By Volume |        | Total as Tar-<br>taric | Volatile |             |             |             |
| No. 965. White. Purity Wine Co.            | Untreated                             | 3.05      |       | 9.70      | 12.09     |        | .62                    |          | .14         | .037 = .252 | .64         |
| No. 966. White. Purity Wine Co.            | Treated                               | 2.90      |       | 9.70      | 12.09     |        | .66                    | .24      | .031 = .256 | .191        | .64         |
| No. 967. Claret. Purity Wine Co.           | Untreated                             | 2.60      |       | 10.07     | 12.54     | .436   | .51                    |          | .041 = .256 | .52         | .48         |
| No. 968. Claret. Purity Wine Co.           | Treated                               | 2.60      |       | 9.85      | 12.27     | .382   | .48                    |          |             | .43         | 2.70        |
| No. 974. White. Purity Wine Co.            | Treated March 1                       | 2.70      |       | 9.34      | 11.64     |        | .47                    |          |             | .49         | 4.87        |
| No. 975. White. Purity Wine Co.            | Treated March 26                      | 2.80      |       | 9.05      | 11.27     |        | .49                    |          |             |             | 2.70        |
| No. 976. White. Purity Wine Co.            | Untreated                             | 2.45      |       | 9.56      | 11.91     |        | .48                    |          |             |             | 4.87        |
| No. 977. White. Purity Wine Co.            | Treated April 13                      | 2.60      |       | 9.27      | 11.55     |        | .48                    |          |             |             | 4.87        |
| No. 978. Red. Purity Wine Co.              | Untreated                             | 2.80      |       | 10.54     | 13.00     | .448   | .46                    |          |             |             | 4.87        |
| No. 979. Red. Purity Wine Co.              | Treated March 1                       | 3.20      |       | 9.85      | 12.27     | .424   | .46                    |          |             |             | 4.87        |
| No. 980. Red. Purity Wine Co.              | Treated March 26                      | 3.00      |       | 10.07     | 12.54     | .455   | .44                    |          |             |             | 4.87        |
| No. 981. Red. Purity Wine Co.              | Treated April 3                       | 2.95      |       | 9.78      | 12.18     | .416   | .43                    |          |             |             | 4.87        |
| No. 982. Natoma Zinfandel. Purity Wine Co. | Treated 30 days (in bottles 3 months) | 3.25      |       | 7.99      | 10.00     | .302   | .52                    |          |             |             | 4.87        |
| No. 983. Claret. Purity Wine Co.           | Run through magnetic filter           | 2.45      |       | 10.63     | 13.09     |        | .52                    |          |             |             | 4.87        |
| No. 984. Folle Blanche. Purity Wine Co.    | Treated 30 days (in bottles 3 months) | 2.60      |       | 8.98      | 11.18     |        | .40                    |          |             |             | 4.87        |
| No. 985. Bannister Claret. Purity Wine Co. | Original untreated                    | 4.60      | 1.40  | 11.31     | 13.82     | .554   | .17                    |          |             |             | 4.87        |
| No. 986. Bannister Claret. Purity Wine Co. | Treated 3 times, magnetic filter      | 4.60      |       | 11.00     | 13.45     | .53    | .15                    |          |             |             | 4.87        |
| No. 987. Bannister Claret. Purity Wine Co. | Treated 5 times, magnetic filter      | 4.60      |       | 10.00     | 13.45     | .520   | .49                    | .08      |             |             | 4.87        |
| No. 988. Natoma Zinfandel. Purity Wine Co. | Sample just before treatment          |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 989. Natoma Zinfandel. Purity Wine Co. | After 4 days' treatment               |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 990. Natoma Zinfandel. Purity Wine Co. | After 10 days' treatment              |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 991. Natoma Zinfandel. Purity Wine Co. | After 15 days' treatment              |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 992. Natoma Zinfandel. Purity Wine Co. | Sample just before treatment          |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 993. Bannister Claret. Purity Wine Co. | After 4 days' treatment               |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 994. Bannister Claret. Purity Wine Co. | After 10 days' treatment              |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 995. Bannister Claret. Purity Wine Co. | After 15 days' treatment              |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 996. Bannister Claret. Purity Wine Co. | Before pasteurizing                   |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 997. Zinfandel. J. Gallegos.           | Before pasteurizing                   |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 998. Zinfandel. J. Gallegos.           | Sample of wine sent to New York       |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 999. Claret. J. Gallegos.              | Before treatment                      | 2.40      |       | 9.70      | 12.09     |        | .63                    |          |             |             | 4.87        |
| No. 1000. White. Hill & Marshall           | After 3 1/2 days' treatment           |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 1001. White. Hill & Marshall           | After 10 days' treatment              |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 1002. White. Hill & Marshall           | After 15 days' treatment              |           |       |           |           |        |                        |          |             |             | 4.87        |
| No. 1003. White. Hill & Marshall           | After 15 days' treatment              |           |       |           |           |        |                        |          |             |             | 4.87        |

|           |         |                 |                        |            |       |       |      |     |       |       |
|-----------|---------|-----------------|------------------------|------------|-------|-------|------|-----|-------|-------|
| No. 1004. | Red.    | Purity Wine Co. | Treated "old windings" | 2.80       | 11.31 | 13.82 | .489 | .43 | ..... | ..... |
| No. 1003. | Red.    | Purity Wine Co. | Treated "new windings" | 3.70 small | 11.07 | 13.54 | .429 | .51 | ..... | ..... |
| No. 1009. | Red.    | H. H. Harris    | Original               | 3.80 small | 10.81 | 13.27 | .359 | .74 | .21   | ..... |
| No. 1010. | Red.    | H. H. Harris    | "Filtered"             | 3.80 small | 10.81 | 13.27 | .362 | .74 | .24   | ..... |
| No. 1011. | Claret. | Purity Wine Co. | Original               | 3.20       | 10.63 | 13.09 | .439 | .53 | .23   | ..... |
| No. 1012. | Claret. | Purity Wine Co. | "Purifier"             | 3.20       | 10.16 | 12.64 | .417 | .52 | .08   | ..... |

### Character After Treatment.

No. 995. Quality medium, but preferable to treated.  
 No. 996. Judge unfavorably of result of treatment, absolutely without character, only acid and alcohol.  
 No. 997. Fair, ordinary claret, which I would not treat.  
 No. 998. Well developed, bouquet and in re pleasant on the whole, but with less bouquet, and does not appear to be aged by the treatment.  
 No. 999. Unsatisfactory results, some question as to whether sample was properly taken.  
 No. 997-85. Turbid condition, slightly turbid color, high acidity, but not as good as the original.  
 No. 998. Slight remnant of Zinfandel bouquet, but neutral wine; somewhat cooked odor, flat taste, no character left, decidedly diminished acid.  
 No. 999. Turbid condition, like original; no Zinfandel bouquet and agreeable bouquet, vinous flavor well developed, pleasant acid, very marked and excessive astringency as compared with acid; pleasant wine as it stands; well pronounced, except as to astringency.  
 No. 999. Wine has lost its freshness decidedly; very pronounced, rather unpleasant astringency; decidedly less bouquet than in untreated; flattest of the lot.  
 No. 999. Characteristic bouquet imperceptible, general vinosity appears increased, excessively pronounced astringency; wine, as a whole, flat and unpalatable.  
 No. 992. Little bouquet, but general vinous odor very pronounced, wine quite flat as compared with untreated; in general, that the bouquet has decreased and vinosity increased, so as to produce a general claret flavor.  
 No. 993. Turbid condition, bouquet undeveloped with odor of fermentation, taste full of carbonic gas and decidedly sweet, high astringency, light vinosity, high alcohol.  
 No. 994. Less carbonic gas, and on the whole, more satisfactory than untreated sample.  
 No. 995. Still better, and not flat.  
 No. 996. Cleaner than untreated and of more vinous odor, although no bouquet perceptible; decidedly flat to taste, but vinosity apparently more developed.  
 No. 997. As a whole, of fair vinosity, a faint intimation of "milk-sourness" to taste.  
 No. 998. Appears not to have sufficiently recovered from pasteurization to judge of its quality.  
 No. 999. Wine very much improved over unpasteurized sample; no "bottled taste."  
 No. 1000. Very turbid condition, pleasant, well-developed bouquet, only fairly developed vinosity, no mousey taste as yet, sharp, manifestly "milk-sour" acid; should say that it contains Chasseelas.  
 No. 1001. Less turbid condition and deeper tinted than untreated, lost bouquet, wine quite flat.  
 No. 1002. Bouquet somewhat recovered, wine less flat.  
 No. 1003. Bouquet still very light, but wine decidedly smoother than original; would be quite drinkable when recovered.  
 No. 1004. Turbid condition, high astringency, low acid, apparently sound.

## ANALYSIS AND EXPOSURE EXPERIMENTS OF ELECTRIFIED WINES TREATED AT THE VITICULTURAL LABORATORY. 1890.

| No.        | Variety, Grower, and Place of Production.     | Description of Treatment.                                       | ANALYSIS.                 |       |      |           | EXPOSURE. |        |       |             |               |               |                |                |                |
|------------|-----------------------------------------------|-----------------------------------------------------------------|---------------------------|-------|------|-----------|-----------|--------|-------|-------------|---------------|---------------|----------------|----------------|----------------|
|            |                                               |                                                                 | Solid Contents by Spindle | Sugar | Body | Alcohol.  |           | Tannin | Acid. | Total Acid. |               |               |                |                |                |
|            |                                               |                                                                 |                           |       |      | By Weight | By Volume |        |       | Original    | After 4 Days. | After 1 Week. | After 10 Days. | After 13 Days. | After 16 Days. |
|            |                                               |                                                                 |                           |       |      |           |           |        |       |             |               |               |                |                |                |
| No. 1078a. | Franc Pinot. J. T. Doyle, Cupertino           | Untreated                                                       |                           |       | 3.35 | 10.44     | 12.91     | .116   | .502  | .502        | .540          | .535          | .570           | .840           | 1.500          |
| No. 1078a. | Franc Pinot. J. T. Doyle, Cupertino           | Treated April 12, 1890, at the rate of 25 liters per hr., ½ hr. |                           |       |      |           |           |        | .485  | .491        | .502          | .502          | .500           | .686           | 1.630          |
| No. 1078a. | Franc Pinot, 4 gals. J. T. Doyle, Cupertino.  | Untreated                                                       |                           |       |      |           |           |        | .502  | .510        | .495          | .592          | 1.080          |                |                |
| No. 1078a. | Franc Pinot, 11 gals. J. T. Doyle, Cupertino. | Treated ¼ hour                                                  |                           |       |      |           |           |        | .502  | .495        | .532          | .750          | .915           |                |                |
| No. 1078a. | Franc Pinot, ½ bot. J. T. Doyle, Cupertino.   | Treated 1½ hours                                                |                           |       |      |           |           |        | .485  | .480        | .475          | .702          | 1.360          |                |                |
| No. 1202.  | Wine from concentrated must                   | Untreated                                                       |                           |       |      |           |           |        | .485  | .495        | .502          | .680          | 1.334          |                |                |
| No. 1202a. | Wine from concentrated must, ¾ gallon         | Treated 13½ hours                                               |                           |       |      |           |           |        | .487  | .510        | .480          | .712          | 1.920          |                |                |
| No. 1202b. | Wine from concentrated must, ¾ gallon         | Treated 11 hours                                                |                           |       |      |           |           |        | .487  | .502        | .735          | 1.125         | 1.920          |                |                |
| No. 793.   | Carignane (acetic), 2 bottles                 | Original untreated                                              |                           |       |      |           |           |        |       |             |               |               |                |                |                |
| No. 793.   | Carignane (acetic), 2½ gallons                | Treated April 17, 1890, ½ hour (10 am.)                         |                           |       |      |           |           |        | .480  | .115        |               |               |                |                |                |
| No. 836.   | Teinturier Mâle, 2 bottles                    | Untreated                                                       |                           |       |      |           |           |        | .622  |             |               |               |                |                |                |
| No. 836.   | Teinturier Mâle, 8 gallons                    | Treated April 23, 1890, ½ hour                                  |                           |       |      |           |           |        | .600  |             |               |               |                |                |                |
| No. 869.   | Chauché Noir, ½ gallon                        | Untreated                                                       |                           |       |      |           |           |        | .476  |             |               |               |                |                |                |
| No. 869.   | Chauché Noir, ½ gallons                       | Treated April 24, 1890, ½ hour                                  |                           |       |      |           |           |        | .476  |             |               |               |                |                |                |
| No. 917.   | Chasselas de Fontainebleau, ¼ gallon          | Untreated                                                       |                           |       |      |           |           |        | .465  |             |               |               |                |                |                |
| No. 917.   | Chasselas de Fontainebleau, 8 gallons.        | Treated April 25, 1890, ½ hour                                  |                           |       |      |           |           |        | .442  |             |               |               |                |                |                |
| No. 831.   | Grenache, ½ gallon                            | Untreated                                                       |                           |       |      |           |           |        | 1.065 |             |               |               |                |                |                |
| No. 831.   | Grenache, 6 gallons                           | Treated April 25, 1890, 1½ hrs.                                 |                           |       |      |           |           |        | 1.030 |             |               |               |                |                |                |
| No. 903.   | Black Hamburg, ½ gallon                       | Untreated                                                       |                           |       |      |           |           |        | .630  |             |               |               |                |                |                |
| No. 903.   | Black Hamburg, 6 gallons                      | Treated April 25, 1890, ½ hour                                  |                           |       |      |           |           |        | .585  |             |               |               |                |                |                |
| No. 926.   | Gros Verdot, ½ bottle                         | Untreated                                                       |                           |       |      |           |           |        | .544  |             | .577          | .615          | .840           | 1.410          | 2.020          |
| No. 926.   | Gros Verdot, ½ gallon                         | Treated April 26, 1890, ½ hour                                  |                           |       |      |           |           |        | .640  |             | .540          | .622          | .990           | 1.905          | 1.940          |
| No. 926.   | Gros Verdot, 2 gallons                        | Treated April 26, 1890, ½ hour                                  |                           |       |      |           |           |        | .636  |             | .547          | .615          | .722           | .750           | 1.040          |
| No. 926.   | Gros Verdot, 2 gallons                        | Treated April 26, 1890, 1 hour                                  |                           |       |      |           |           |        | .630  |             | .530          | .547          | .615           | .772           | 1.040          |
| No. 926.   | Gros Verdot, 1½ gallons                       | Untreated                                                       |                           |       |      |           |           |        | .526  |             |               |               |                |                |                |
| No. 1007.  | Malvoisie, 1890, ½ gallon                     | Treated April 26, 1890, ¼ hrs.                                  |                           |       |      |           |           |        | .465  |             | .480          | .480          | 1.385          | 3.840          |                |
| No. 1007a. | Malvoisie, 1890, ½ gallons                    | Treated April 29, 1890, 1 hour                                  |                           |       |      |           |           |        | .442  |             | .405          | .405          | .980           | 1.820          |                |



## RECORD OF TREATMENT AND TASTING.

**No. 831. Grenache.** Vintage of 1888.

1890. *February 26.* (Before treatment.) Bright, not as bad as when last tasted, but bouquet and sweet-sour taste very disagreeable.

*April 25.* Treated by electric current for half an hour.

*July 17.* Lees show a very few filaments.

*July 20.* Bright character unchanged.

*August 11.* Bottled.

1891. *January 31.* The treated wine and two samples of untreated, bottled, respectively, May 18, 1889, and February 27, 1890, bright, but unchanged in character; the earliest bottled is the deepest in color.

*May 26.* No perceptible change in the wine, either treated or untreated.

**No. 836. Teinturier Male.** Vintage of 1888.

1890. *February 18.* (Before treatment.) Bright, good color and flavor, but lactic taint slightly perceptible to taste.

*April 24.* Treated by electric current for half an hour.

*July 15.* Lees sound.

*July 24.* Clear, with good color; bouquet not good; rather agreeable flavor, mature taste, and fair quality; deteriorated since last tasting.

*August 13.* Bottled.

1891. *February 2.* Bright, good color, no bouquet, slight acetic smell; flavor rather good; quality fair.

*May 26.* Both treated and untreated are flat and poor; the treated has a little more acetic taint.

**No. 869. Chauche Noir.** Vintage of 1888.

1890. *February 26.* (Before treatment.) Clear; bouquet and flavor show lactic taint; quality thin and inferior; after-taste bitter.

*April 24.* Treated by electric current for one half hour.

*July 23.* Clear; has changed little since last tasting.

*August 13.* Bottled.

1891. *February 12.* Wine bottled in spring of 1889 quite spoiled. The treated wine is clear; no deposit; smell and taste has a somewhat lactic taint, otherwise would be rather a good wine.

*May 26.* Both treated and untreated wine bottled.

*April 24.* Flat and exhausted; the treated the most exhausted.

**No. 903. Black Hamburg.** Vintage of 1888.

1890. *February 25.* (Before treatment.) Clear; tastes and smells of lactic ferment; thin and much deteriorated.

*April 25.* Treated by electric current for one half hour.

*March 1.* Racked.

*July 15.* Lees show a few long lactic germs.

*July 20.* Quite spoiled by lactic ferment; distilled.

*May 26.* The treated and untreated are equally bad.

**No. 917. Chasselas de Fontainebleau.** Vintage of 1888.

1890. *February 12.* Clear; smells like rancid butter.

*April 24.* Treated one half hour by electric current.

*July 18.* Lees show no bad germs; bright, but bouquet is not good; flavor rather agreeable, but after-taste not good; quality fair.

*August 18.* Bottled.

1891. *February 26.* No. 1. *Untreated wine*, bottled June 14, 1889. Bright; no bouquet; suspicious of bad acid; quality poor.

No. 2. *Untreated wine*, bottled February 14, 1890. Bright, with a slight deposit, a little bouquet; a neutral but agreeable flavor; fresh, and rather good.

No. 3. *Treated wine.* Bright; no deposit; a little exhausted, but otherwise like No. 2.

*May 26.* No change since last tasting.

**No. 926. Gros Verdot.** Vintage of 1888.

1890. *February 26.* (Before treatment.) Bright, with well-developed bouquet; quality good, but still rather coarse and immature.

*April 26.* Experiment 1: Wine treated by electric current for one quarter of an hour. Experiment 2: Wine treated by electric current for one half an hour. Experiment 3: Wine treated by electric current for one hour. Experiment 4: Wine treated by electric current for four and one quarter hours.

*July 18.* Experiment 2: Lees show bitter and acetic germs. Experiment 3: Lees show no bad germs.

*July 24.* Experiment 2: Less bouquet than Experiment 3, otherwise the same. Experiment 3: Bright; good color; marked and pleasing bouquet; full flavor and acid; good quality.

*August 11.* Both samples bottled.

1891. *March 2.* No. 1. *Untreated wine*, bottled May 14, 1889, not quite clear; intense color; no bouquet; raw and undeveloped, but sound. No. 2. *Untreated wine*, bottled February 2, 1890, bright, full, rich bouquet and flavor; quality very fresh and drinkable; well matured.

Nos. 3 and 4. *Treated wine.* (Experiments 2 and 3): Less bouquet and inferior flavor to No. 2, and Experiment 2 has a peculiar, flat taste.

*May 26.* Wine treated one quarter of an hour is the best of the treated wines; wine treated four and one quarter hours is rather flat, but otherwise nearly as good as the others.

**No. 1078a. Pinots.**

*1889. November 7.* Turbid wine without bouquet, of low acid and slightly flat and bitter.

*1890. January 14.* Wine not quite clear, with light color, moldy and disagreeable bouquet; taste smooth, but slightly bitter after-taste; medium acid; full astringency, alcohol, and body. Quality poor, but apparently sound.

*January 29.* Lees show a few small lactic germs.

*April 12.* Racked the wine; four gallons kept untreated; twelve gallons treated for one half hour, one half gallon for eleven hours.

*April 14.* Treated wine much improved, but has lost color and acidity.

*June 7.* Lees of untreated wine thick and full of lactic ferment; it tastes very poor. Lees of that treated half an hour show less lactic; however, it is also of poor quality.

*July 8.* Treated wine not quite clear; bouquet not good; lactic taste unchanged. Untreated wine nearly clear, but has strong lactic taint.

*July 31.* Lees of treated wine has many very short lactic germs; that of the untreated is full of lactic germs.

Other observations made in *December, 1890, and January, 1891*, showed that the wine was completely spoiled from lactic fermentation.

**No. 1202a. Concentrated Must.**

Five gallons of must allowed to commence fermentation.

*1890. April 12.* Temperature of must 20° C. (68° F.); specific gravity, 1.061. Treatment started at 3:20 P. M.

The must was passed through the tubes three times in two and a half hours: 4:10 P. M., temperature 25° C. (77° F.); 5:00 P. M., temperature 28° C. (82° F.); 5:30 P. M., temperature 29° C. (84° F.).

No obvious diminution of fermentation, perhaps the reverse; the yeast rising rapidly with the increase in temperature.

*April 17.* Murk put in demijohn in the hot-box.

*April 18.* Some fermentation.

*April 19.* More fermentation; temperature, 85° F.

*April 23.* Fermentation continues; temperature, 82° F. Fermentation gradually diminished till May 3d.

*May 6.* The wine racked into demijohns and corked up.

*1891. May 26.* Clear, clean-tasting; contains much carbonic acid.

**No. 1202b. Concentrated Must.**

Some must of the same strength as that used for No. 1202a was fermented down till it contained 2.15 per cent of sugar.

*1890. April 15.* Six tubes filled with must at 10:15 A. M., and current started. At 1:30 P. M., intermission of half hour. Current stopped at 4:30 P. M.

*April 16.* Current started at 8:45 A. M. At 1:30 P. M., temperature 107° F.; stopped one half hour to cool; 2 P. M., temperature 95° F.; 2:30 P. M., temperature 85° F.; 3 P. M., stopped. Whole time of treatment exclusive of stops, eleven hours. Murk put in demijohns in the hot-box.

*April 18.* Very little visible fermentation.

*April 19.* More fermentation; temperature, 85° F.

*April 23.* Fermentation continues at 82° F.

*April 24.* Fermentation continues at 84° F. Fermentation then gradually diminished till May 3d.

*May 6.* The wine was racked into demijohns and corked up.

*1891. May 26.* Not so clear as No. 1202a, and has a suspicion of lactic taint.

**No. 1097. Malvoisie. Fresno. Vintage of 1889.**

*1890. April 27.* Before treatment it was turbid, and had lactic germs.

*April 29.* Divided into three parts and treated by electric current. No. 1097a treated one hour; 2-gallon keg; No. 1097b treated one and one half hours; No. 1097c treated two hours.

*May 1.* Two parts of No. 1097c re-treated, viz.: No. 1097d treated two hours more; total, four hours; No. 1097e treated six hours more; total, eight hours; No. 1097f treated twelve hours.

*May 5.* Half of 1097b re-treated. No. 1097e treated ten and one half hours more; total, twelve hours. All samples put in bottle except No. 1097a.

*July 10.* No. 1097a. Lees are full of lactic germs; taste improved, not so lactic.

*August 4.* No. 1097a. Lees full of lactic germs.

*September 1.* No. 1097a. Bright, almost without color; faint lactic taint; tastes mature, but flat and insipid. (That in keg distilled off; in bottles kept.)

*May 26.* Untreated wine is thick, and quite spoiled.

Nos. 1097a and 1097b. Cloudy, and of very poor quality, but better than the untreated; heavy deposit in bottle.

No. 1097c. Not clear, but slightly better than the above.

other side with a tube parallel to the above, by which the ozonized gas is conducted to the place where it is to be used. Refrigeration is provided for, around each of the elements of the ozonizer. The electric current is brought to the apparatus by means of two general conductors.

The current may come: (1) From a battery, with passage through an induction-coil; (2) from a dynamo, with passage through an induction-coil; (3) from a dynamo, with passage in a transformer; (4) from a special electric machine going at high tension.

The amount of ozone produced depends upon the number of elements in the apparatus. Villon and Genin manufacture machines that can produce from 500 liters to 50 cubic meters of ozone per hour. By the word ozone one should understand ozonized oxygen or ozonized air, for all the oxygen is not transformed entirely into ozone. Industrially and in usual work, the Villon apparatus gives ozonized oxygen containing 20 per cent of ozone, and ozonized air containing from 2 to 3 per cent. But when the gases are first completely dried over lime and calcium chloride, and the apparatus cooled to a temperature of  $-20^{\circ}$ , oxygen can be obtained containing 50 per cent of ozone; a result which had never before been reached.

In order to avoid any manipulation, the ozone treatment is made in the casks themselves. The oxygen contained in tubes, where it is compressed at 120 atmospheres, passes through the ozonizer very slowly, and at a pressure of one and a half atmospheres, where it is electrified, and is conducted by means of a metallic tube to the cask containing the wine. The quality of the gas and the duration of the treatment are variable, according to the nature of the wine and the effects that are desired. It is more rational to make two or three treatments, as has been done with the Algerian wines, in which a very appreciable improvement has been found.

In regard to the chemical changes which occur in the wine, but little is observable, for as can be seen from the following analyses made by Villon, it seems that tannin is the substance most affected:

|                                  | Untreated. | Treated. |
|----------------------------------|------------|----------|
| Alcohol.....                     | 8.93       | 8.87     |
| Extract at $100^{\circ}$ C. .... | 25.21      | 25.15    |
| Ash.....                         | 3.41       | 3.40     |
| Cream of tartar.....             | 3.88       | 3.88     |
| Free tartaric acid.....          | 0.15       | 0.10     |
| Acidity as $H_2SO_4$ .....       | 5.85       | 5.75     |
| Tannin.....                      | 1.65       | 1.15     |
| Potassium sulphate.....          | 0.54       | 0.54     |

According to Villon the ozonization would replace advantageously the heating which has the disadvantage of destroying certain properties inherent to the wine.

The Villon-Genin apparatus is used for the treatment of alcohol and brandies, and for other and various industrial purposes.



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Variety

**Bordeaux**

No. 1114. Malbeck .....  
No. 1107. Cabernet Fran .....  
No. 1113. Cabernet Sauv .....  
No. 1150. Gros Verdot .....  
No. 1167. Tannat .....  
No. 1109. Merlot .....  
No. 1120. Merlot .....  
No. 1058. Gamay Teintu .....  
No. 1073. Gamay Teintu .....  
No. 1140. Gros Manseng .....  
No. 1159. St. Macaire .....

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## OBSERVATIONS AND DATA REGARDING GRAPE CROP ON THE EXPERIMENTAL PLOT AT CUPERTINO.

| VARIETY.                 | OBSERVATIONS MADE JULY 23, 1887.                                                                                                                                                                                                                                                                           | OBSERVATIONS MADE AT TIME OF PICKING,<br>OCTOBER 5-27, 1887.                | BORDEAUX TYPE.     |                              |                                  |                     |                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------|------------------------------|----------------------------------|---------------------|--------------------------------------|
|                          |                                                                                                                                                                                                                                                                                                            |                                                                             | NUMBER OF VINES... | TOTAL WEIGHT, IN POUNDS..... | AVERAGE PER VINE, IN POUNDS..... | DATE OF PICKING.... | AVERAGE PER VINE, IN POUNDS—1886.... |
| <b>1887.</b>             |                                                                                                                                                                                                                                                                                                            |                                                                             |                    |                              |                                  |                     |                                      |
| Cabernet Sauvignon ..... | At large, all pruned as long as wood was mature, three canes as a rule; is quite heavily loaded with bunches, but over one half destroyed by coulure after bloom.                                                                                                                                          |                                                                             |                    |                              |                                  |                     |                                      |
| Cabernet Franc .....     | At large, very heavily loaded, much more than Cabernet Sauvignon; was pruned like the latter; coulure from 40 to 50 per cent.                                                                                                                                                                              |                                                                             |                    |                              |                                  |                     |                                      |
| Cabernet Franc .....     | In experimental row, long-pruned about the same as in the vineyard; good crop, with from 30 to as much as 60 per cent coulure on different vines, altogether about one half. Short-pruned. Small crop, with very heavy coulure; 70 to 80 per cent at bloom or immediately after; considerable second crop. | Crop suffered very much from coulure and drying of bunches before ripening. | 20                 | 40                           | 2.0                              | Oct. 11             | 21.2                                 |
| Gros Verdot .....        | Long-pruned. Good crop; 25 per cent coulure at end of bloom; some second crop.                                                                                                                                                                                                                             | Not much coulure, but many (5 per cent) bunches dried.                      | 20                 | 142                          | 7.1                              | Oct. 17             | 79.2                                 |
| Verdot .....             |                                                                                                                                                                                                                                                                                                            |                                                                             | 20                 | 12                           | 0.6                              | Oct. 19             |                                      |

## 1887. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                 | OBSERVATIONS MADE JULY 23, 1887.                                                                                                                                                                                      | OBSERVATIONS MADE AT TIME OF PICKING.<br>OCTOBER 5-27, 1887.                                     | NUMBER OF VINES... | TOTAL WEIGHT, IN POUNDS ..... | AVERAGE PER VINE, IN POUNDS..... | DATE OF PICKING ... | AVERAGE PER VINE, IN POUNDS—1886... |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------|-------------------------------|----------------------------------|---------------------|-------------------------------------|
| Bordeaux Type—Continued. |                                                                                                                                                                                                                       |                                                                                                  |                    |                               |                                  |                     |                                     |
| Merlot .....             | Long-pruned. Small crop, but little coulure.                                                                                                                                                                          | -----                                                                                            | 20                 | 20                            | 1.00                             | Oct. 13             | -----                               |
| Malbeck .....            | Long-pruned. A fair crop on vine, but quite 75 per cent coulure taken in full bloom; many bunches completely dried in bloom; a little second crop. Practically no first crop, hence no coulure; a little second crop. | -----                                                                                            | 20                 | 25                            | 1.25                             | Oct. 5              | 12.6                                |
|                          |                                                                                                                                                                                                                       | -----                                                                                            | 20                 | -----                         | -----                            | -----               | -----                               |
| Gamay Teinturier .....   | Long-pruned. Heavy crop; coulure about 15 per cent came after bloom; 40 to 50 per cent Short-pruned. Half crop only; 40 to 50 per cent coulure quite late; some second crop.                                          | About two thirds of crop spoiled from drying up of bunches before ripening.                      | 20                 | 70                            | 3.50                             | Oct. 12             | 29.8                                |
|                          |                                                                                                                                                                                                                       |                                                                                                  | 20                 | 24                            | 1.20                             | Oct. 12             | -----                               |
| Teinturier Mâle.....     | Long-pruned. Fair crop, but 50 per cent late coulure. Short-pruned. Almost no first crop, with coulure as above; much second crop.                                                                                    | Nearly 60 per cent of crop consisted of dried bunches both in long-pruned and short-pruned rows. | 20                 | 28                            | 1.40                             | Oct. 11             | 22.0                                |
|                          |                                                                                                                                                                                                                       |                                                                                                  | 20                 | 15                            | 0.75                             | Oct. 11             | -----                               |
| Gros Mansenc .....       | Long-pruned. A small crop; little coulure.                                                                                                                                                                            | Crop suffered very much from uneven ripening.                                                    | 20                 | 70                            | 3.50                             | Oct. 13             | -----                               |



| Gros Mansenc      | Long-pruned<br>Short-pruned                                                                                                                                                | Ten per cent of crop spoiled from uneven ripening on long-pruned row; dried up.                                                                                                               | 20<br>20 | 65<br>16  | 3.25<br>0.80 | Oct. 17<br>Oct. 17 |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|--------------|--------------------|
| BURGUNDY TYPE.    |                                                                                                                                                                            |                                                                                                                                                                                               |          |           |              |                    |
| Chauché Noir      | Long-pruned. Fair crop; 50 per cent coulure.<br>Short-pruned. Fair crop; 80 per cent coulure.                                                                              |                                                                                                                                                                                               | 20<br>20 | 110<br>40 | 5.50<br>2.00 | Oct. 5<br>Oct. 7   |
| Pinot de Pernant  | Long-pruned. Heavy crop; 50 per cent coulure; some second crop in bloom.                                                                                                   | Wherever the grapes were protected from the action of the sun by the foliage the bunches were not dried up.                                                                                   | 20       | 100       | 5.00         | Oct. 6             |
| Pinot Noirien     | Long-pruned. Heavy crop coulure on exposed bunches only; mostly none.                                                                                                      | No perfect bunches; all having more or less dried grapes; in some cases due to overripeness.                                                                                                  | 20       | 64        | 3.20         | Oct. 6             |
| Franc Pinot       | Long-pruned. Heavy crop; coulure variable; some as much as 70 to 80 per cent, some 25 per cent.                                                                            | A good second crop; first crop almost entirely spoiled by the berries drying before ripening; not one full or perfect bunch; nine tenths of the crop suffered; nearly all dried bunches sour. | 20       |           |              | Oct. 13            |
| Pinot St. Georges | Long-pruned. Good crop; little coulure. Short-pruned. Fair crop; almost total coulure; much second crop.                                                                   | More than three fourths of the crop dried, owing to uneven ripening.                                                                                                                          | 20<br>20 | 6<br>32   | 0.30<br>1.60 | Oct. 25<br>Oct. 25 |
| Meunier           | Long-pruned. Good first crop; a little early coulure, but bunches filled up. Short-pruned. Very little first crop, with some late coulure; much second crop just in bloom. |                                                                                                                                                                                               | 20<br>20 | 22        | 1.10         | Oct. 13            |
|                   |                                                                                                                                                                            |                                                                                                                                                                                               |          |           |              | 25.5               |

## 1887. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                     | OBSERVATIONS MADE JULY 23, 1887.                                                                                                                                                           | OBSERVATIONS MADE AT TIME OF PICKING,<br>OCTOBER 5-27, 1887.                              | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING.... | AVERAGE PER VINE,<br>IN POUNDS—1886.... |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|-----------------------------------------|
| ITALIAN TYPE.                |                                                                                                                                                                                            |                                                                                           |                    |                                 |                                     |                     |                                         |
| Barbera .....                | Long-pruned. Fair bearer; much coulure; much second crop.<br>Short-pruned .....                                                                                                            | Crop suffered very much from drying up of berries before ripening, and also from coulure. | 20                 | 226                             | 11.30                               | Oct. 27             | ---                                     |
| Nebbiolo Bourgu. ....        | Long-pruned. Crop light; no coulure; little second crop.                                                                                                                                   | Only about twelve pounds of grapes picked.                                                | 20                 | ---                             | ---                                 | Oct. 25             | ---                                     |
| Nebbiolo Fino. ....          | Short-pruned. Practically no crop.                                                                                                                                                         | ---                                                                                       | 20                 | ---                             | ---                                 | ---                 | ---                                     |
| Fresa .....                  | Long-pruned. Fair crop; some coulure on second bud canes, sometimes total; in bloom; average 25 per cent; some second crop.<br>Short-pruned. Very little crop; some second; heavy coulure. | Crop suffered very much from coulure.                                                     | 20                 | 200                             | 10.00                               | Oct. 14             | 23.5                                    |
| Crabb's Black Burgundy ..... | Long-pruned. Fair crop; coulure 25 per cent.<br>Short-pruned. Small crop; coulure same.....                                                                                                | Crop suffered considerably from coulure, and to a less degree from overripeness.          | 20                 | 110                             | 5.50                                | Oct. 13             | 20.2                                    |
| Moscato Fino .....           | Long-pruned .....                                                                                                                                                                          | ---                                                                                       | 20                 | 15                              | 0.75                                | Oct. 19             | ---                                     |
| Moscato Fino .....           | Short-pruned .....                                                                                                                                                                         | ---                                                                                       | 20                 | 10                              | 0.50                                | Oct. 27             | ---                                     |

## SOUTHERN FRENCH TYPE.

| Petite Sirah..... | Long-pruned. Good crop; 50 per cent coulure immediately after bloom.<br>Short-pruned. Small crop; coulure almost total; bloom burnt. | Small crop, owing to coulure and drying of bunches before ripening.                                                                         | 20       | 63      | 3.15        | Oct. 14            | 30.7          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|----------|---------|-------------|--------------------|---------------|
| Sérine.....       | Long-pruned. Good crop; almost no coulure.                                                                                           | Crop poor; more than 50 per cent lost from coulure and uneven ripening.                                                                     | 20       | 36      | 1.80        | Oct. 20            | -----         |
| Mondeuse.....     | Long-pruned. Very heavy crop; 25 per cent coulure; some second (at Mission San José, good crop, almost no coulure).                  | Suffered slightly from drying before ripening.                                                                                              | 20       | 235     | 11.75       | Oct. 25            | -----         |
| Cinsaut .....     | Long-pruned. Fair crop; 50 per cent coulure after bloom (at Mission San José, good crop; coulure same as above).                     | Fully one third of crop lost from drying up of berries before ripening; crop also injured by coulure.                                       | 20       | 120     | 6.00        | Oct. 6             | -----         |
| Ploussard .....   | Long-pruned. Small crop; very little coulure.<br>Short-pruned. Very light crop; little coulure; no second crop.                      | Poor crop, owing to coulure and drying of bunches before ripening.                                                                          | 20<br>20 | 54<br>7 | 2.70<br>.35 | Oct. 11<br>Oct. 11 | 44.0<br>----- |
| Aramon.....       | Long-pruned. Very heavy crop; no coulure....                                                                                         | Crop very unsatisfactory; many bunches dried up; some half dry, others one third dry, etc.; also full and well developed; not much coulure. | 20       | 145     | 7.45        | Oct. 13            | -----         |
| Mourastel.....    | Long-pruned. Good crop; coulure very bad, 70 to 80 per cent; some second crop.                                                       | Fair crop.....                                                                                                                              | 20       | 218     | 10.90       | Oct. 19            | -----         |

## 1887. OBSERVATIONS AND DATA AT CUPERINO—Continued.

| VARIETY.              | OBSERVATIONS MADE JULY 23, 1887.                                                                                                       | OBSERVATIONS MADE AT TIME OF PICKING,<br>OCTOBER 5-27, 1887.                                                          | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING..... | AVERAGE PER VINE,<br>IN POUNDS—1886.... |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|----------------------|-----------------------------------------|
| <b>AUSTRIAN TYPE.</b> |                                                                                                                                        |                                                                                                                       |                    |                                 |                                     |                      |                                         |
| Grossblane.....       | Long-pruned. Fair crop; very little coulure; a little second crop.<br>Short-pruned. Small crop; much second crop; no coulure anywhere. | Crop suffered considerably from coulure.<br>-----                                                                     | 20<br>20           | 204<br>40                       | 10.20<br>2.00                       | Oct. 19<br>Oct. 19   | 34.2<br>-----                           |
| <b>PORT TYPE.</b>     |                                                                                                                                        |                                                                                                                       |                    |                                 |                                     |                      |                                         |
| Tinta Madeira .....   | Long-pruned. Fair crop; 50 per cent coulure.                                                                                           | Nearly all bunches dried up; berries have appearance of raisins, but the majority of them are not by any means sweet. | 20                 | 16                              | 0.80                                | Oct. 6               | -----                                   |
| Tinta Amarella .....  | Long-pruned. Fair crop; much coulure.....                                                                                              | Quality good.....                                                                                                     | 20                 | 150                             | 7.50                                | Oct. 20              | -----                                   |
| Tinto Cão.....        | Long-pruned. Small crop; no coulure.....                                                                                               | Crop good, as regards quality.....                                                                                    | 20                 | 80                              | 4.00                                | Oct. 20              | -----                                   |
| Bastardo .....        | Long-pruned. Heavy crop; 30 per cent coulure.                                                                                          | Crop fair.....                                                                                                        | 20                 | 155                             | 7.75                                | Oct. 6               | -----                                   |

## 1888. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.               | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888.                                                                                                                                                                                                                 | OBSERVATIONS BY L. E. BENTON AT TIME<br>OF PICKING.                                                                                                                        | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING ... | AVERAGE PER VINE,<br>IN POUNDS—1887... | AVERAGE PER VINE,<br>IN POUNDS—1886... |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|----------------------------------------|----------------------------------------|
| <b>BOURDEAUX TYPE.</b> |                                                                                                                                                                                                                                                                       |                                                                                                                                                                            |                    |                                 |                                     |                     |                                        |                                        |
| Cabernet Franc.....    | Long-pruned. Hence crop light, and some second; a few vines pruned longer well loaded, and berries black; a good deal of coulure in bloom, on some vines total, which was abundant despite short pruning, showing the vine to bear it better than Cabernet Sauvignon. | Crop almost a failure, owing to early coulure; a large per cent—estimated 60—of the bunches were burned at bloom, and are now withered shreds; no second crop to speak of. | 9                  | 37                              | 4.11                                | Oct. 1              | 2.0                                    | 21.2                                   |
| Gros Verdot.....       | Short-pruned. Much crop, but in places considerable coulure in bloom; hence, but light crop of berries; these have mostly turned color where canes are long; no second crop.                                                                                          | Short-pruned. Light crop; great deal of coulure; crop also shortened by burning of some of the bunches in bloom.<br>Long - pruned. Fair crop; much coulure.                | 19                 | 65                              | 3.42                                | Oct. 22             | 1.0                                    | ---                                    |
| Petit Verdot.....      | Long-pruned. Bearing to end of canes; much very early coulure; crop not satisfactory; a little second; no obvious sunburn, but vine does not shade well, and looks scraggy.                                                                                           | Crop fair; bunches loose; the leaves, especially the lower, burnt, exposing the grapes, which are also burnt.                                                              | 20                 | 70                              | 2.50                                | Oct. 22             | 0.6                                    | ---                                    |
| Merlot.....            | Long-pruned. Much sunburnt in foliage; too open; 60 to 70 per cent coulure in bloom; practically no crop; the older vines in block better, but almost no crop there also.                                                                                             | Straggling habit; fully 50 per cent of early and late coulure; fruit much sunburnt; scanty crop; fair growth of vines; but little second crop.                             | 20                 | 27                              | 1.35                                | Sept. 24            | 1.0                                    | ---                                    |

## OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                 | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888.                                                                                                                                                                                                                                                                   | OBSERVATIONS BY L. E. BENTON AT TIME<br>OF PICKING.                                                                                                                                            | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING ... | AVERAGE PER VINE,<br>IN POUNDS—1887... | AVERAGE PER VINE,<br>IN POUNDS—1886... |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|----------------------------------------|----------------------------------------|
| Bordeaux Type—Continued. |                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                |                    |                                 |                                     |                     |                                        |                                        |
| Malbeck                  | Short-pruned. Extremely light first crop; some second; enormous growth of wood; first crop berries very large, full color, and some with 15 per cent sugar; second crop half grown.<br>Long-pruned                                                                                                                      | Owing to 80 per cent coulure, the grape makes no showing at all; some second crop; too much new wood made on all vines, particularly on the short-pruned.                                      | 19                 | 13                              | 0.70                                | Sept. 17            | 1.25                                   | 12.60                                  |
| Gamay Teinturier         | Short-pruned. Small first crop; heavy second crop forms a prominent feature; first crop all dark-tinted; some with 14 per cent sugar; coulure one third; second crop half grown; very little coulure; evidently would have produced abundantly with longer pruning; deserves attention as a good bearer.<br>Long-pruned | Bunches small and compact, but little coulure; a little sunburn, and berries quickly turning to raisins; much better crop on long-pruned than on short-pruned; on the latter more second crop. | 40                 | 326                             | 8.15                                | Sept. 12            | { s.p.<br>1.2                          | { l.p.<br>29.80                        |
| Teinturier Mâle          | Pruned half-long. Much second crop; would have done well if pruned long; first crop has no early coulure, but many little berries with large ones; juice very deep-tinted, quite sweet; leaves already turning red below.<br>Long-pruned. Heavy crop                                                                    | Bunches small and compact, with 50 to 70 per cent small berries; five tenths early coulure; but little second crop; greatly coulured.                                                          | 40                 | 315                             | 7.87                                | Sept. 12            | { s.p.<br>1.4<br>{ 0.75                | 2.20                                   |

|                       |                                                                                                                                                                                                          |             |                                                                                                                                                                                                                                                                                    |           |    |     |       |          |      |      |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|-----|-------|----------|------|------|
| Gros Mansenc          | Short-pruned. Much second crop; some coulure in first; bunches quite lax; few berries; berries small; a tolerable crop as the variety goes, but evidently must be pruned longer, and then may bear late. | Long-pruned | Fair crop on short-pruned; undoubtedly the 40 per cent early coulure has caused the looseness of the bunches, as those near the ground have suffered less; at this date (October 1st) some of the berries are drying and shrinking; some second crop; lower foliage shows sunburn. | Good crop | 20 | 66  | 3.30  | Oct. 1   | 0.80 | ---- |
| Gros Mansenc          | Long-pruned. Heavy crop, but vines very open, like Merlot; berries small and rotund; ought to be pruned shorter and kept close; may yield a fair crop, but sunburn may kill it.                          |             | Moderate crop; same tendency of lower foliage to burn and expose the grapes as mentioned above; crop very much later than on other rows.                                                                                                                                           |           | 20 | 120 | 6.00  | Oct. 22  | 3.50 | ---- |
| <b>BURGUNDY TYPE.</b> |                                                                                                                                                                                                          |             |                                                                                                                                                                                                                                                                                    |           |    |     |       |          |      |      |
| Chaudé Noir           | Short-pruned. Immense grower; bloomed well, but 70-80 per cent coulure in most vines; a few retain a fair crop, and there is some second crop; some berries quite sour, yet unlike Troussseau.           |             | Short-pruned. Crop light and bunches suffering more from coulure than on long-pruned vines; no second crop; enormous growth of vine; light burning of leaves.                                                                                                                      |           | 20 | 53  | 2.65  | Sept. 27 | 2.00 | ---- |
| Chaudé Noir           |                                                                                                                                                                                                          |             | Long-pruned. Bunches mostly full and compact, showing not over 25 per cent early coulure; no second crop; good growth of vine and good crop.                                                                                                                                       |           | 20 | 232 | 11.60 | Sept. 27 | 5.50 | 65.3 |
| Pinot de Pernant      | Long-pruned. Well set with bunches, but much second crop; farthest advanced towards maturity of all Pinots.                                                                                              |             | Bunches small and loose; 50 per cent early coulure; berries beginning to dry; much second crop also suffering from coulure; lower leaves burn and fall, exposing fruit.                                                                                                            |           | 20 | 123 | 6.15  | Sept. 12 | 5.00 | ---- |

## 1888. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                        | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888.                                                                                                                                       | OBSERVATIONS BY L. E. BENTON AT TIME<br>OF PICKING.                                                                                                                                   | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING....  | AVERAGE PER VINE,<br>IN POUNDS—1887... | AVERAGE PER VINE,<br>IN POUNDS—1886... |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|----------------------|----------------------------------------|----------------------------------------|
| <b>Burgundy Type—Continued.</b> |                                                                                                                                                                                             |                                                                                                                                                                                       |                    |                                 |                                     |                      |                                        |                                        |
| Pinot Noirien.....              | Long-pruned. Two canes; much second crop; good first crop; apparently best bearer of all the Pinots here; a little sunburn on exposed bunches, and some early coulure.                      | Small, compact bunch, with little coulure; heavy second crop; much new wood.                                                                                                          | 19                 | 100                             | 5.26                                | Sept. 13             | 3.2                                    | ---                                    |
| Pinot St. Georges.....          | Long-pruned. Set much second crop; fairly full, but bunches very small, very black, and compact, approaching maturity; needs more wood.                                                     | Bunches small and loose from much early coulure; berries burned and turning to raisins from loss of lower leaves; much second crop.                                                   | 18                 | 140                             | 7.77                                | Sept. 12             | L.P. { 0.3<br>S.P. { 1.6               | ---                                    |
| Franc Pinot .....               | Long-pruned. Two canes, but needs more; much second crop; well loaded with small bunches; much early coulure on exposed bunches, but not much in aggregate; has now some 15 per cent sugar. | Bunches under medium size and compact where very fully set; coulure varying from 20-60 per cent; large second crop; vines made good growth of new wood; leaves mature and fall early. | 20                 | 115                             | 5.75                                | Sept. 13             | ---                                    | ---                                    |
| Meunier.....                    | Short-pruned. Abundant second crop; very little first crop, hardly enough for experiment.                                                                                                   | Bunches loose from excessive coulure; a large second and third crop.<br>Long-pruned. Good first crop; and little second crop.                                                         | 20<br>5            | 50<br>55                        | 2.50<br>11.00                       | Sept. 13<br>Sept. 13 | 0.0<br>1.1                             | ---                                    |



|                                     |                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                |    |     |       |         |       |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|---------|-------|
| Pfeffer's Cabernet<br>(Robin Noir?) | Good crop; very little coulure; some sunburn where exposed; mostly colored, but quite acid, yet enough for experiment; pruned just right; good success here.                                                                    | Fine bunch, free from coulure, scald, or rot; the sugar percentage has shown no increase during the past two weeks, and the softening and shriveling show that the grape has reached its full maturity; no second crop; vigorous grower.                                       | 20 | 145 | 7.25  | Oct. 10 | ----- |
| <b>ITALIAN TYPE.</b>                |                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                |    |     |       |         |       |
| Nebbiolo Fino                       | Pruned half-long—two canes. Crop quite light; little coulure at bloom; bunches near ground ripening fast; considerable second crop; need more wood.                                                                             | Riper in pulp than Nebbiolo Bourgu, but less sugar; crop not heavy; crop reduced by robbing; as much as 50 per cent of early coulure, and some burning of bunch at bloom; berries, although ripe, have a purplish translucency; vines have made good growth; some second crop. | 16 | 60  | 3.75  | Oct. 23 | ----- |
| Nebbiolo Bourgu                     | Has no more crop than the Nebbiolo Fino; some strong vines none, but a little second crop.                                                                                                                                      | This variety is bearing a little better than Nebbiolo Fino; there is less coulure; bunches are larger; in other respects very similar.                                                                                                                                         | 13 | 40  | *3.07 | Oct. 23 | ----- |
| Fresa                               | Pruned half-long—two canes. Fair crop; also some second crop; a little early coulure (15 per cent); enormous growth of cane, like Palomino; should have more wood left; seems to be maturing evenly.<br>Long-pruned. Heavy crop | Bearing poorly; the trouble seems to be the burning of the bunch at bloom; bunches uneven, due to early coulure; a fine growth of vines; but little second crop.<br>Bearing well; no second crop; coulure as above.                                                            | 18 | 50  | 3.11  | Oct. 18 | ----- |
|                                     |                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                | 20 | 295 | 14.75 | Oct. 18 | 28.5  |

\*Some grapes were taken out before picking.

## 1888. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                       | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888.                                                                                                                                                                                                                                                          | OBSERVATIONS BY L. E. BENTON AT TIME<br>OF PICKING.                                                                                                                                                                                                              | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING.... | AVERAGE PER VINE,<br>IN POUNDS—1887... | AVERAGE PER VINE,<br>IN POUNDS—1886... |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|----------------------------------------|----------------------------------------|
| <b>Italian Type—Continued.</b> |                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                  |                    |                                 |                                     |                     |                                        |                                        |
| Crabb's Black Burgundy.        | Short-pruned—three spurs. Had a heavy bloom, but was very coulered in full bloom; hence, crop scarce and second crop abundant; couler looks like caused by frost; leaves also dead on blackened twigs in many places; berries mostly turned dark; second crop quite small yet.<br>Long-pruned. Good crop.----- | Practically no crop; no second crop; rank growth of vines.                                                                                                                                                                                                       | 16                 | 15                              | 0.93                                | Oct. 10             | 0.75                                   | ---                                    |
|                                |                                                                                                                                                                                                                                                                                                                | Bunches variable; some compact, others loose from the great amount of early couler; many bunches entirely destroyed in early bloom; best bunches near ground; poorest 12 to 20 inches up; no second crop; good growth of vine; tendency to bear at end of canes. | 15                 | 170                             | 11.33                               | Oct. 10             | 5.50                                   | 20.2                                   |
| Barbera -----                  | Long-pruned. Much second crop in spite of long pruning; immense grower; good crop on some vines; nothing on others; total quite unsatisfactory; not as good as at Mission San José.                                                                                                                            | No crop to speak of, only two vines bearing respectably; bunches small, greatly reduced by early and late couler; as much second crop as first; couler equal on both; berries of all sizes; vine of moderate growth, leaves falling.                             | 19                 | 50                              | 2.63                                | Oct. 22             | 11.30                                  | ---                                    |

| Moscatallo Fino       | Short-pruned. Black Muscat; bloomed heavily, but had much coulure shortly after bloom; has some second crop; berries only partly turned color as yet.                                                     | Good crop; not picked                                                                                                                                                                                                                                             |    |     |       |         |       |      |  |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|---------|-------|------|--|
| SOUTHERN FRENCH TYPE. |                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                   |    |     |       |         |       |      |  |
| Petite Sirah          | Short-pruned. Light crop, with much coulure, both in bloom and in stunted little berries, while the large ones are full tinted; much second crop, in some vines having much coulure; no sunburn.          | The crop of this vine has been badly hurt by 50 per cent early and late coulure, mostly early; more second crop than is good; the vine is vigorous and fruit well covered; no sunburn.                                                                            | 20 | 80  | 4.00  | Oct. 8  |       |      |  |
|                       | Long-pruned. Better crop                                                                                                                                                                                  | Second crop unimportant                                                                                                                                                                                                                                           | 20 | 108 | 5.40  | Oct. 8  | 3.15  | 30.7 |  |
| Sérine                | Long-pruned. Heavy crop bloomed, but vine too open and much sunburn; not much coulure; berries small and behind in development; very dry.                                                                 | Fair crop; bunches not very compact, but have not suffered much from any cause; fruit sparingly covered and consequently some sunburn; good growth of new wood; no second crop to mention.                                                                        | 20 | 135 | 6.75  | Oct. 18 | 1.80  |      |  |
| Mondeuse              | Long-pruned. Heavy crop bloomed, but quite 50 per cent coulure, making lax bunches; quite unlike those of Mission San José; a great deal of second crop.                                                  | Bearing heavy crop, but not ripening properly for lack of foliage; large portion of berries withering and drying while yet unripe; lower leaves falling and not over 25 per cent of fruit covered; good growth of new wood; no coulure or second crop to mention. | 17 | 285 | 16.78 | Oct. 10 | 11.75 |      |  |
| Cinsaut               | Long-pruned. Good crop; borne all along canes and at end; some second crop; better leaves, more spurs, and shorter canes; crop, as a whole, not so satisfactory as at Mission San José, and more coulure. |                                                                                                                                                                                                                                                                   | 20 | 240 | 12.00 | Nov. 5  | 6.00  |      |  |

## 1888. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                               | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888.                                                                                                                                                                                                                                                 | OBSERVATIONS BY L. E. BENTON AT TIME<br>OF PICKING.                                                                                 | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING.... | AVERAGE PER VINE,<br>IN POUNDS—1887... | AVERAGE PER VINE,<br>IN POUNDS—1886... |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|----------------------------------------|----------------------------------------|
| <b>Southern French Type—Continued.</b> |                                                                                                                                                                                                                                                                                                       |                                                                                                                                     |                    |                                 |                                     |                     |                                        |                                        |
| Petit Bouschet                         |                                                                                                                                                                                                                                                                                                       |                                                                                                                                     | 20                 | 405                             | 20.25                               | Oct. 25             |                                        |                                        |
|                                        |                                                                                                                                                                                                                                                                                                       | Heavy crop, but sour as yet; bunch<br>lax, with 25 per cent of early coulure;<br>good growth of vine, with too much<br>second crop. |                    |                                 |                                     |                     |                                        |                                        |
| Aramon                                 | Long-pruned. Fair crop, far behind; some<br>second crop; much early coulure; ber-<br>ries very sour.                                                                                                                                                                                                  |                                                                                                                                     | 19                 | 130                             | 6.84                                | Nov. 7              | 7.45                                   |                                        |
|                                        |                                                                                                                                                                                                                                                                                                       |                                                                                                                                     |                    |                                 |                                     |                     |                                        |                                        |
| Ploussard                              | Short-pruned. Rather light crop, but<br>varying in different vines; no second<br>crop; on some bloom is burnt very<br>heavily, but there is no sunburn; ber-<br>ries well shaded and full, some vines<br>have almost none; pretty sour, though<br>colored.<br>Long-pruned. Vines No. 8-20 in the row. | Bunches loose and irregular; much<br>coulure, 40-80 per cent; little sec-<br>ond crop; heavy growth of new<br>wood.                 | 20                 | 50                              | 2.50                                | Sept. 13            | 0.35                                   |                                        |
|                                        |                                                                                                                                                                                                                                                                                                       | Bunch like the short-pruned, but with<br>less coulure; moderate growth of<br>vines, and better crop.                                | 12                 | 105                             | 8.75                                | Sept. 13            | 2.70                                   | 4.40                                   |

|                 |                                                                                                                                                                                                                                        |                                                                                                            |   |     |       |         |       |       |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---|-----|-------|---------|-------|-------|
| Mourastel ..... | Long-pruned, and yet some second crop; first crop quite heavy, and borne close to canes; should be pruned short, as the ends of the canes get loaded and hang over on the ground; first crop lightly coulered, second crop heavily so. | Bunch compact, but little troubled with coulure; vines vigorous; foliage standing well and covering fruit. | 9 | 135 | 15.00 | Oct. 25 | 10.90 | ----- |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---|-----|-------|---------|-------|-------|

## AUSTRIAN AND HUNGARIAN TYPE.

|                 |                                                                                                                                            |                                                                                                                                                      |    |     |       |         |       |       |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|---------|-------|-------|
| Grossblau ..... | Spur-pruned. Scant first crop, much second and scattered; a few longer canes have good crop; very little coulure. Long-pruned. Heavy crop. | Fully 70 per cent second crop; no coulure or sunburn.<br>Bearing very well; fruit borne evenly along canes; no coulure or sunburn; some second crop. | 20 | 95  | 4.75  | Oct. 10 | 2.00  | ----- |
|                 |                                                                                                                                            |                                                                                                                                                      | 13 | 315 | 24.23 | Oct. 10 | 10.20 | 34.2  |

## PORT TYPE.

|                      |                                                                                                                                                                                                           |                                                                                                                                                                    |    |     |       |         |      |       |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|---------|------|-------|
| Tinta Madeira .....  | Well shaded; looks fresh, dark green, and bears a fair and well-developed crop under the foliage; great grower; considerable coulure; berries well advanced toward maturity, like Pinots; little coulure. | Medium-sized bunch, showing some early coulure; no second crop; good growth of vine; grapes very ripe at picking.                                                  | 18 | 135 | 7.50  | Oct. 3  | 0.80 | ----- |
| Tinta Amarella ..... | Long-pruned. Heavy crop; some early coulure and some second crop; well shaded; will give plenty of material for experiment; no sunburn.                                                                   | Vines are bearing heavily, with considerable early coulure, but has not prevented a good crop; good growth of new wood; no second crop; leaves fresh and vigorous. | 20 | 235 | 11.75 | Oct. 23 | 7.50 | ----- |
| Tinto Cão .....      | Long-pruned. Light crop, no second; but vine shades and looks well; some early coulure; some with good crop, and there will be some material; good grower; light green leaves.                            | Bunches small and loose; grapes in good condition in every respect except a little coulure; growth vigorous and leaves fresh.                                      | 20 | 85  | 4.25  | Nov. 7  | 4.00 | ----- |

## 1888. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY. | OBSERVATIONS BY E. W. HILGARD,<br>AUGUST 22-23, 1888. | OBSERVATIONS BY L. E. BENTON AT TIME<br>OF PICKING. | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING.... | AVERAGE PER VINE,<br>IN POUNDS—1887... | AVERAGE PER VINE,<br>IN POUNDS—1886... |
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|          |                                                       |                                                     |                    |                                 |                                     |                     |                                        |                                        |
|          |                                                       |                                                     |                    |                                 |                                     |                     |                                        |                                        |

## Port Type—Continued.

|                |                                                                                                                                                             |                                                                                                                                   |    |     |       |        |      |     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|--------|------|-----|
| Bastardo ..... | Long-pruned. Mostly quite a heavy crop; borne low down; evidently a short pruner; much coulure; many small berries; a little sunburn; tastes rapidly sweet. | Fine crop; bunches fair size, compact, with but little coulure; no second crop; good growth of new wood; shows some burnt leaves. | 20 | 256 | 12.65 | Oct. 8 | 7.75 | --- |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----|-----|-------|--------|------|-----|

## 1889.

## BORDEAUX TYPE.

| VARIETY. | OBSERVATIONS BY<br>W. G. KLEE, FROM JULY 15<br>TO AUGUST 15, 1889. | OBSERVATIONS BY L. E. BENTON AT TIME OF PICKING, 1889. | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING.... | AVERAGE PER VINE,<br>IN POUNDS—1888... |
|----------|--------------------------------------------------------------------|--------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|----------------------------------------|
|          |                                                                    |                                                        |                    |                                 |                                     |                     |                                        |
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|          |                                                                    |                                                        |                    |                                 |                                     |                     |                                        |
|          |                                                                    |                                                        |                    |                                 |                                     |                     |                                        |

## Cabernet Franc .....

Long-pruned. Small crop; much coulure; too dense growth.

Pruned with three and four canes; good, strong vines; great amount coulure, and consequently small crop; bunches almost bare from early coulure; berries very sweet for date, but this owing to light crop.

|                      |                                               |                                                                                                                                                                                                  |    |     |      |          |       |
|----------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|------|----------|-------|
| Gros Mansenc.....    | Half - long - pruned. Good crop.              | Light crop; enough new wood; is losing foliage; some second crop; bunches loose, showing more or less coulure; picked too late.                                                                  | 19 | 80  | 4.2  | Oct. 2   | 3.3   |
|                      | Short-pruned .....                            | Vigorous; very light first crop; some second crop; is losing foliage; some coulure; some fruit drying.                                                                                           | 19 | 50  | 2.6  | Oct. 2   | 8.1   |
| Gros Verdoot.....    | Half - long - pruned. Much coulure.           | Generally a light crop with a great deal of coulure; vines rank; bunches very light from coulure.                                                                                                | 19 | 110 | 5.8  | Oct. 8   | 3.4   |
|                      | Long-pruned .....                             | Has less growth and more crop than above; has more and better set bunches than the half-long vines.                                                                                              | 18 | 200 | 11.1 | Oct. 8   | 6.8   |
| Malbeck .....        | Long-pruned. Light crop; much coulure.        | Bearing in the usual way; a few straggling bunches and rank vines; bunches light from early coulure.                                                                                             | 20 | 75  | 3.8  | Sept. 14 | 4.3   |
| Merlot .....         | Long-pruned. Much coulure.                    | Much better than last year; bunches coulured and straggling; after the usual manner; fully ripe at date.                                                                                         | 20 | 70  | 3.5  | Sept. 26 | 1.4   |
| Petit Verdoot .....  | Half - long - pruned. Good crop for its kind. | Growth free, and in some vines rank; bunches loose; some coulure.                                                                                                                                | 19 | 100 | 5.3  | Oct. 4   | 2.5   |
| St. Macaire.....     | Long - pruned. Immense crop.                  | Is vigorous enough to stand long pruning, holding its leaves better than last year, but not well enough; fruit badly exposed and drying; bunches slightly coulured; not as compact as last year. | 18 | 455 | 25.3 | Oct. 9   | 8.4   |
| Tannat.....          | Long-pruned. Heavy crop.....                  | Has made fair growth; foliage burns a little; bunches generally loose and straggling, on account of early coulure; compact where well set.                                                       | 10 | 280 | 28.0 | Oct. 14  | ----- |
| Teinturier Mâle..... | Long-pruned. Fair crop.....                   | Vines pruned just right; not so much second crop as last year; bunches generally solid, but usually with much late coulure; some entirely composed of small berries as large as buckshot.        | 38 | 225 | 5.9  | Sept. 20 | 7.9   |

## OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                                                        | OBSERVATIONS BY<br>W. G. KIEEL, FROM JULY 15<br>TO AUGUST 15, 1889. | OBSERVATIONS BY L. E. BENTON AT TIME OF PICKING, 1889.                                                                                                                                                                                                               | NUMBER OF VINES...     | TOTAL WEIGHT, IN<br>POUNDS ..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING....              | AVERAGE PER VINE,<br>IN POUNDS—1888... |
|-----------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------------|-------------------------------------|----------------------------------|----------------------------------------|
| <b>Bordeaux Type—Continued.</b>                                 |                                                                     |                                                                                                                                                                                                                                                                      |                        |                                  |                                     |                                  |                                        |
| Gamay Teinturier .....                                          | Very early. Small growth;<br>good crop.                             | Pruned all styles; vines and crop consequently variable;<br>generally good crop; some vines too much wood and<br>second crop; others just ripe; long-pruned vines have<br>very even crop; bunches very developed, compact, and<br>fine; condition at gathering good. | 23                     | 280                              | 12.2                                | Sept. 14                         | 8.2                                    |
| Affenthaler .....                                               | Long-pruned. Heavy crop.                                            | Nine bearing vines; long-pruned; fair amount of new<br>wood; an average grower; foliage a little tender; solid<br>bunches.                                                                                                                                           | 9                      | 180                              | 20.0                                | Oct. 8                           | ---                                    |
| <b>BURGUNDY TYPE.</b>                                           |                                                                     |                                                                                                                                                                                                                                                                      |                        |                                  |                                     |                                  |                                        |
| Franc Pinot.....<br>Pinot de Fernant.....<br>Pinot Noirien..... | Long-pruned.....<br>Long-pruned.....<br>Long-pruned.....            | Bearing well; vines in prime condition; bunches well set<br>and compact; a trifle overripe at picking; quite good<br>crop for their kind.                                                                                                                            | { 20<br>18<br>215 } 20 | 225<br>130<br>215                | 11.3<br>10.6<br>10.8                | Sept. 14<br>Sept. 14<br>Sept. 14 | 5.8<br>6.2<br>5.3                      |
| Pinot St. Georges .....                                         | Long-pruned. Good crop;<br>some coulure.                            | Vines more vigorous than the other Black Pinots; foliage<br>darker and holding better; leaf more cut and serrated;<br>bunches more often shouldered, and berries larger and<br>more oval.                                                                            | 18                     | 135                              | 7.5                                 | Sept. 14                         | 7.8                                    |
| Blauer Burgunder .....                                          | Long-pruned. Good crop.                                             | Good growth; foliage good; a little second crop; small,<br>compact bunches; overripe at time of picking.                                                                                                                                                             | 7                      | 150                              | 7.1                                 | Sept. 14                         | ---                                    |



|                                                   |                                                         |                                                                                                                                                                                                                      |    |     |      |          |       |
|---------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|------|----------|-------|
| Meunier .....                                     | Long-pruned. Very good crop.                            | A good crop of nice bunches; fruit too ripe at date .....                                                                                                                                                            | 17 | 180 | 10.6 | Sept. 14 | 11.0  |
| Chauché Noir .....                                | Long-pruned. Good crop.                                 | Vine and fruit in good condition; one of the most vigorous growers; bunches scattering; loose from coulure; in good condition for picking.                                                                           | 20 | 200 | 10.0 | Sept. 26 | 11.6  |
| Pfeffer's Cabernet .....                          | Long-pruned. Large crop; fine bunches.                  | Making abundant wood; foliage a little tender, as last year; bunches large and solid, averaging about right for picking at date.                                                                                     | 20 | 340 | 17.0 | Oct. 5   | 7.3   |
| <b>ITALIAN TYPE.</b>                              |                                                         |                                                                                                                                                                                                                      |    |     |      |          |       |
| Barbera Fina .....                                | Long-pruned. Two vines have good crops, the rest small. | Vines strong; but second crop the vines variable, some losing leaves and others quite green; a few vines bearing fine, compact bunches; the rest have small, loose, and straggling, and both early and late coulure. | 20 | 210 | 10.5 | Oct. 2   | 2.6   |
| Corba Barba Gelata? ..<br>(Bonarda di Gattinara.) | Long-pruned. Good crop.                                 | Good crop on long-pruned vines; a fine grower, with perfect foliage; bunches average-medium and very compact; no coulure; overripe at date.                                                                          | 20 | 200 | 10.0 | Oct. 8   | ----- |
| Provinante? .....                                 | -----                                                   | Long-pruned, with light crop; a free growing vine, with habit of Nebbiolo; bunches long, loose, lax, and peculiar; in that it often has no shoulder; berries resembling Nebbiolo.                                    | 4  | 20  | 5.0  | Oct. 9   | ----- |
| Nebbiolo Bourgu. ....                             | Long-pruned. Good crop; some coulure; immense growth.   | Essentially like Nebbiolo Fina in behavior; apparently a trifle better bearer and stronger grower.                                                                                                                   | 16 | 115 | 7.2  | Oct. 9   | 3.1   |

## OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                | OBSERVATIONS BY<br>W. G. KLEE, FROM JULY 15<br>TO AUGUST 15, 1889. | OBSERVATIONS BY L. E. BENTON AT TIME OF PICKING, 1889.                                                                                                                                       | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING ... | AVERAGE PER VINE,<br>IN POUNDS—1888... |
|-------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|----------------------------------------|
| Italian Type—Continued. |                                                                    |                                                                                                                                                                                              |                    |                                 |                                     |                     |                                        |
| Nebbiolo Fino.....      | Long-pruned. Fair crop;<br>some coulure.                           | Growth too fast; some second crop; foliage in perfect<br>health; the few bunches generally well filled and com-<br>pact; a few with early coulure; in good condition for<br>picking at date. | 18                 | 100                             | 5.6                                 | Oct. 9              | 3.8                                    |
| Spanna .....            | Long-pruned. Very good<br>crop for the kind.                       | Long-pruned vines; make a fair growth; foliage exposing<br>fruit; bunches rather loose and lax, like Nebbiolo; very<br>little coulure.                                                       | 6                  | 90                              | 15.0                                | Oct. 9              | -----                                  |
| Marzemino .....         | -----                                                              | Long-pruned, one-year old vines (grafts), with small crop;<br>a strong growing variety, with foliage of St. Macaire<br>type; bunches much shouldered and loose, but without<br>coulure.      | 4                  | 30                              | 7.5                                 | Oct. 9              | -----                                  |
| Fresa .....             | Short-pruned. Fair crop;<br>some coulure.                          | Making too much wood; much second crop; bunches<br>loose and lax, and not much coulure; a little overripe<br>at picking.                                                                     | 19                 | 120                             | 6.3                                 | Oct. 3              | 14.8                                   |
| Refosco .....           | Long-pruned. Good crop....                                         | Vines one-year old grafts; long-pruned; fair crop; a ready<br>grower with striking foliage; bunches loose and lax;<br>the stems becoming dark at maturity; much early<br>and late coulure.   | 3                  | 45                              | 15.0                                | Oct. 2              | -----                                  |

| Crabb's Black Burgundy       | Long-pruned. Fair crop; coulure.             | Vines strong; some second crop; tends to luxuriant growth; bunches generally good, but occasionally coulured; does not burn easily when exposed; condition at picking good.                                                   | 39 | 500 | 12.8 | Oct. 1   | 11.3  |
|------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|------|----------|-------|
| <b>SOUTHERN FRENCH TYPE.</b> |                                              |                                                                                                                                                                                                                               |    |     |      |          |       |
| Aramon                       | Short-pruned. Good crop; some coulure.       | Vines in good condition; a slow growing variety; bunches well set; fruit cannot stand the sun.                                                                                                                                | 20 | 190 | 9.5  | Oct. 17  | 6.8   |
| Cinsaut                      | Short-pruned                                 | -----                                                                                                                                                                                                                         | 20 | 150 | 7.5  | Oct. 4   | 12.0  |
| Mondeuse                     | Long-pruned                                  | -----                                                                                                                                                                                                                         | 18 | 180 | 10.0 | Oct. 8   | 16.8  |
| Mourastel                    | -----                                        | Short-pruned. Strong grower; good foliage; bunches generally well set; a few show coulure.                                                                                                                                    | 7  | 130 | 18.6 | Oct. 14  | 15.0  |
| Alicante Bouschet            | Long-pruned. Heavy crop.                     | Strong growth; good foliage; loose, open bunches, made lighter by coulure.                                                                                                                                                    | 7  | 225 | 32.1 | Oct. 23  | ----- |
| Petit Bouschet               | Long-pruned. Heavy crop.                     | Heavy crop of much better bunches than last year.-----                                                                                                                                                                        | 19 | 600 | 31.6 | Oct. 12  | 20.3  |
| Petite Sirah                 | Half-long-pruned. Much coulure. Long-pruned. | Light crop; much wood; foliage good; bunches loose, with much coulure; berries of better size than last year. Good crop, with enough wood; bunches and fruit do not differ from half-short vines; loose bunches; large berry. | 40 | 225 | 5.6  | Sept. 20 | 5.4   |
| Sérine                       | Half long-pruned. Good crop.                 | Vines in good condition; a little second crop; naturally a moderate grower; bunches well set and good; fruit getting too ripe.                                                                                                | 19 | 200 | 10.5 | Oct. 8   | 6.8   |

## 1889. OBSERVATIONS AND DATA AT CUPERTINO—Continued.

| VARIETY.                               | OBSERVATIONS BY<br>W. G. KLEE, FROM JULY 15<br>TO AUGUST 15, 1889. | OBSERVATIONS BY L. E. BENTON AT TIME OF PICKING, 1889.                                                                                                              | NUMBER OF VINES... | TOTAL WEIGHT, IN<br>POUNDS..... | AVERAGE PER VINE,<br>IN POUNDS..... | DATE OF PICKING.... | AVERAGE PER VINE,<br>IN POUNDS—1888... |
|----------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------|-------------------------------------|---------------------|----------------------------------------|
| <b>Southern French Type—Continued.</b> |                                                                    |                                                                                                                                                                     |                    |                                 |                                     |                     |                                        |
| Ploussard .....                        | Short-pruned. Small crop;<br>little coulure.                       | Crop light; some coulure; no second crop; bunches generally very loose.                                                                                             | 19                 | 50                              | 2.6                                 | Sept. 20            | 8.8                                    |
| <b>AUSTRIAN AND HUNGARIAN TYPE.</b>    |                                                                    |                                                                                                                                                                     |                    |                                 |                                     |                     |                                        |
| Kadarkas .....                         | .....                                                              | Vines one-year old grafts; a vigorous, productive variety, with good foliage; bunches large, and compact when well set, but generally loose this year from coulure. | 6                  | 100                             | 16.7                                | Oct. 2              | .....                                  |
| Lagrain .....                          | One-year old grafts .....                                          | The long-pruned vines gave a medium crop; vine a free grower, with excellent foliage; bunches large, and loose in character; light early coulure.                   | .....              | .....                           | .....                               | .....               | .....                                  |
| Grossblau .....                        | Short-pruned. Small crop..                                         | Spur-pruned with many spurs; large second crop and rank growth; bunches are variable, but generally small.                                                          | 17                 | 100                             | 5.9                                 | Oct. 2              | 24.3                                   |
| <b>PORT TYPE.</b>                      |                                                                    |                                                                                                                                                                     |                    |                                 |                                     |                     |                                        |
| Tinta Amarella .....                   | Short-pruned. Small crop, and much coulure on some vines.          | Heavy growth of vines; good foliage; bunches generally full set; many berries shriveling on account of cracking.                                                    | 20                 | 180                             | 9.0                                 | Oct. 17             | 11.8                                   |

|                     |                                                       |                                                                                                                   |    |     |      |          |      |
|---------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----|-----|------|----------|------|
| Tinto Cao -----     | Short-pruned. Poor crop; very strong grower.          | The vine is making a very strong growth; some second crop; bunches normal in condition; growth is too strong.     | 20 | 55  | 2.8  | Oct. 23  | 4.3  |
| Tinta Madeira ----- | Long-pruned. Bearing well; much coulure.              | Vine a very free grower, with good foliage; bunches well set; fruit keeps a long time without drying or decaying. | 20 | 280 | 13.0 | Oct. 8   | 7.5  |
| Bastardo -----      | Half - long - pruned. Some vines have very good crop. | Good in every way; a fine crop; vigorous vines; berry and bunches large; the latter compact; ready to pick.       | 20 | 180 | 9.0  | Sept. 26 | 12.7 |

## 1887. DATA REGARDING GRAPES WORKED IN THE VITICULTURAL LABORATORY.

| Variety.                                            | Grower and Place of Production.                 | Date of Crushing Grapes.... | Weight of Grapes in lbs. .... | Percentage of Pomace ..... | Percentage of Stems..... | Gallons of Must Resp. Murk ... | Gallons of Must per Ton of Grapes. .... |
|-----------------------------------------------------|-------------------------------------------------|-----------------------------|-------------------------------|----------------------------|--------------------------|--------------------------------|-----------------------------------------|
| <b>Bordeaux Type.</b>                               |                                                 |                             |                               |                            |                          |                                |                                         |
| No. 709. Malbeck .....                              | J. T. Doyle, Cupertino .....                    | Oct. 11                     | 115.75                        | 16.40                      | 4.55                     | 8%                             | 149.01                                  |
| No. 716. Cabernet Franc .....                       | J. T. Doyle, Cupertino .....                    | Oct. 12                     | 98.00                         | 18.05                      | 5.35                     | 6½                             | 136.50                                  |
| No. 714. Cabernet Sauvignon .....                   | J. T. Doyle, Cupertino .....                    | Oct. 12                     | 85.00                         | 12.35                      | 6.20                     | 6%                             | 155.75                                  |
| No. 744. Verdol (long-pruned) .....                 | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 19                     | 104.00                        | 13.85                      | 3.10                     | 8%                             | 154.00                                  |
| No. 734. Merlot .....                               | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 15                     | 19.50                         | 7.70                       | 3.85                     | 1½                             | 150.00                                  |
| No. 728. Tannat .....                               | J. P. Smith, Livermore .....                    | Oct. 13                     | 92.00                         | 17.70                      | 6.70                     | 5½                             | 138.80                                  |
| No. 730. Gros Mansenc (long-pruned) .....           | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 14                     | 66.75                         | 16.50                      | 5.25                     | 5½                             | 151.80                                  |
| No. 689. Charbono .....                             | J. P. Smith, Livermore .....                    | Sept. 26                    | 78.00                         | 17.30                      | 5.80                     | 6½                             | 153.80                                  |
| No. 722. Teinturier Mâle (long-pruned) .....        | J. T. Doyle, Cupertino .....                    | Oct. 13                     | 35.00                         | 15.70                      | 5.00                     | 2½                             | 142.90                                  |
| No. 721. Gamay Teinturier (long-pruned) .....       | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 13                     | 69.75                         | 16.85                      | 4.35                     | 5½                             | 152.00                                  |
| <b>Burgundy Type.</b>                               |                                                 |                             |                               |                            |                          |                                |                                         |
| No. 688. Pinot .....                                | J. P. Smith, Livermore .....                    | Sept. 26                    | 74.00                         | 21.62                      | 5.40                     | 5½                             | 158.50                                  |
| No. 703. Pinot de Pernant .....                     | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 8                      | 73.00                         | 15.06                      | 6.85                     | 5½                             | 141.90                                  |
| No. 704. Pinot Noirien .....                        | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 8                      | 41.00                         | 15.85                      | 6.70                     | 3½                             | 152.20                                  |
| No. 733. Chaudé Noir (Klee) .....                   | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 6                      | 110.00                        | 16.35                      | 4.55                     | 8½                             | 147.65                                  |
| <b>Italian Type.</b>                                |                                                 |                             |                               |                            |                          |                                |                                         |
| No. 740. Fresa .....                                | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 17                     | 97.00                         | 14.95                      | 4.23                     | 7½                             | 153.40                                  |
| No. 786. Barbera Fina .....                         | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 23                     | 168.00                        | 10.12                      | 5.36                     | 13½                            | 158.00                                  |
| No. 690. Crabb's Black Burgundy (long-pruned) ..... | E. W. Hlgard, Mission San José .....            | Sept. 23                    | 109.00                        | 17.90                      | 3.70                     | 8½                             | 148.90                                  |
| No. 732. Crabb's Black Burgundy (long-pruned) ..... | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 15                     | 100.50                        | 10.65                      | 3.29                     | 7½                             | 158.00                                  |
| <b>Southern French Type.</b>                        |                                                 |                             |                               |                            |                          |                                |                                         |
| No. 710. Trouseau .....                             | Margherita Vineyard, Fresno .....               | Aug. 31                     | 67.00                         | 13.45                      | 2.60                     | 5½                             | 156.70                                  |
| No. 680. Trouseau .....                             | J. T. Doyle, Cupertino .....                    | Oct. 11                     | 109.00                        | 15.60                      | 4.14                     | 7½                             | 144.40                                  |
| No. 718. Ploussard .....                            | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 13                     | 50.75                         | 10.90                      | 3.55                     | 9%                             | 142.80                                  |
| No. 739. Sirah .....                                | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 17                     | 56.00                         | 16.95                      | 5.80                     | 3½                             | 133.95                                  |
| No. 767. Sérine (long-pruned) .....                 | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 22                     | 34.25                         | 19.00                      | 5.96                     | 2%                             | 138.60                                  |
| No. 788. Mondeuse (long-pruned) .....               | J. T. Doyle, Experimental Plot, Cupertino ..... | Oct. 22                     | 93.00                         | 16.13                      | 4.57                     | 7½                             | 158.50                                  |
| No. 684. Carligane .....                            | Margherita Vineyard, Fresno .....               | Sept. 21                    | 134.00                        | 11.20                      | 4.48                     | 11                             | 164.10                                  |
| No. 711. Carligane .....                            | J. T. Doyle, Cupertino .....                    | Oct. 11                     | 105.00                        | 11.90                      | 4.73                     | 8%                             | 150.45                                  |

## Southern French Type—Continued.

|                                     |                               |                                            |          |        |       |      |                                 |        |
|-------------------------------------|-------------------------------|--------------------------------------------|----------|--------|-------|------|---------------------------------|--------|
| No. 787.                            | Carignane                     | A. J. Salazar, Mission San José            | Nov. 1   | 200.00 | 10.00 | 6.00 | 16.1 <sup>1</sup> <sub>16</sub> | 160.60 |
| No. 782.                            | Mataro                        | J. T. Doyle, Cupertino                     | Oct. 27  | 108.00 | 13.43 | 4.63 | 8 <sup>1</sup> <sub>16</sub>    | 149.60 |
| No. 785.                            | Mataro                        | J. Bergin, Mountain View                   | Oct. 15  | 48.75  | 11.30 | 3.09 | 3 <sup>1</sup> <sub>16</sub>    | 153.95 |
| No. 760.                            | Mataro                        | Margherita Vineyard, Fresno                | Oct. 21  | 111.00 | 11.71 | 2.93 | 8 <sup>1</sup> <sub>16</sub>    | 154.25 |
| No. 702.                            | Cinsaut                       | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 8   | 81.00  | 12.93 | 2.78 | 6 <sup>1</sup> <sub>16</sub>    | 169.65 |
| No. 772.                            | Cinsaut                       | E. W. Hilgard, Mission San José            | Oct. 25  | 55.00  | 20.86 | 3.27 | 4 <sup>1</sup> <sub>16</sub>    | 174.90 |
| No. 729.                            | Aramon                        | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 14  | 98.25  | 10.77 | 4.58 | 8 <sup>1</sup> <sub>16</sub>    | 168.05 |
| No. 725.                            | Petit Bouschet                | J. P. Smith, Livermore                     | Oct. 13  | 97.50  | 10.77 | 5.64 | 7 <sup>1</sup> <sub>16</sub>    | 180.20 |
| No. 712.                            | Grenache                      | J. T. Doyle, Cupertino                     | Oct. 11  | 94.75  | 17.42 | 5.28 | 7 <sup>1</sup> <sub>16</sub>    | 151.90 |
| No. 736.                            | Grenache                      | J. Bergin, Mountain View                   | Oct. 15  | 55.75  | 11.67 | 4.67 | 3 <sup>1</sup> <sub>16</sub>    | 136.80 |
| No. 685.                            | Grenache                      | Margherita Vineyard, Fresno                | Sept. 21 | 148.00 | 13.50 | 4.90 | 11 <sup>1</sup> <sub>16</sub>   | 153.50 |
| No. 757.                            | Mourastel (long-pruned)       | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 21  | 97.00  | 14.43 | 4.13 | 7 <sup>1</sup> <sub>16</sub>    | 159.80 |
| <b>Austrian and Hungarian Type.</b> |                               |                                            |          |        |       |      |                                 |        |
| No. 752.                            | Grosblane                     | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 20  | 100.75 | 11.40 | 3.25 | 8 <sup>1</sup> <sub>16</sub>    | 166.25 |
| No. 691.                            | Zinfandel                     | Juan Gallegos, Mission San José            | Oct. 1   | 217.00 | 10.85 | 4.15 | 16 <sup>1</sup> <sub>16</sub>   | 155.20 |
| No. 799.                            | Zinfandel (third crop)        | Juan Gallegos, Mission San José            | Nov. 15  | 113.50 | 11.50 | 6.20 | 9 <sup>1</sup> <sub>16</sub>    | 169.05 |
| No. 686.                            | Zinfandel                     | R. Wegener, Livermore                      | Sept. 22 | 98.00  | 16.85 | 8.16 | 6 <sup>1</sup> <sub>16</sub>    | 129.60 |
| No. 687.                            | Zinfandel                     | J. P. Smith, Livermore                     | Sept. 26 | 71.00  | 16.90 | 7.05 | 5 <sup>1</sup> <sub>16</sub>    | 147.80 |
| No. 679.                            | Zinfandel (first crop)        | Margherita Vineyard, Fresno                | Aug. 26  | 80.50  | 13.65 | 3.40 | 6 <sup>1</sup> <sub>16</sub>    | 161.60 |
| No. 717.                            | Zinfandel (second crop)       | Margherita Vineyard, Fresno                | Oct. 12  | 120.75 | 12.85 | 3.11 | 10 <sup>1</sup> <sub>16</sub>   | 166.90 |
| <b>Port Type.</b>                   |                               |                                            |          |        |       |      |                                 |        |
| No. 769.                            | Tinto Cão                     | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 21  | 79.00  | 17.35 | 5.06 | 5 <sup>1</sup> <sub>16</sub>    | 142.30 |
| No. 768.                            | Tinta Amarella                | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 22  | 99.25  | 7.05  | 3.53 | 8                               | 161.30 |
| No. 705.                            | Bastardo                      | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 8   | 79.00  | 13.30 | 3.80 | 6 <sup>1</sup> <sub>16</sub>    | 159.70 |
| <b>1888.</b>                        |                               |                                            |          |        |       |      |                                 |        |
| <b>Bordeaux Type.</b>               |                               |                                            |          |        |       |      |                                 |        |
| No. 850.                            | Malbeck                       | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 18 | 99.00  | 12.11 | 6.06 | 8 <sup>1</sup> <sub>16</sub>    | 166.29 |
| No. 800.                            | Malbeck                       | J. Gallegos, Expt'l Plot, Mission San José | Oct. 9   | 54.50  | 13.73 | 5.50 | 4 <sup>1</sup> <sub>16</sub>    | 160.55 |
| No. 886.*                           | Cabernet Franc (long-pruned)  | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 2   | 65.50  | 10.60 | 5.34 | 6 <sup>1</sup> <sub>16</sub>    | 163.91 |
| No. 877.*                           | Cabernet Franc (short-pruned) | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 2   | 10.00  | 15.05 | 5.00 | 7 <sup>1</sup> <sub>16</sub>    | 160.72 |
| No. 887.                            | Cabernet Franc                | J. Gallegos, Expt'l Plot, Mission San José | Oct. 9   | 98.00  | 15.05 | 5.61 | 7 <sup>1</sup> <sub>16</sub>    | 160.72 |
| No. 926.*                           | Gros Verdot (short-pruned)    | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 23  | 54.00  | 14.20 | 4.63 | 13 <sup>1</sup> <sub>16</sub>   | 158.28 |
| No. 927.*                           | Gros Verdot (long-pruned)     | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 23  | 115.00 | 16.83 | 4.78 | 3 <sup>1</sup> <sub>16</sub>    | 139.42 |
| No. 928.                            | Petit Verdot (Row 55)         | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 23  | 52.00  | 13.76 | 4.81 | 6 <sup>1</sup> <sub>16</sub>    | 153.09 |
| No. 878.*                           | Gros Mansenc (short-pruned)   | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 2   | 125.00 | 16.91 | 6.40 | 13 <sup>1</sup> <sub>16</sub>   | 151.98 |
| No. 878.*                           | Gros Mansenc (long-pruned)    | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 2   | 102.00 | 13.25 | 4.90 | 7 <sup>1</sup> <sub>16</sub>    | 151.98 |
| No. 931.                            | Gros Mansenc                  | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 23  | 102.00 | 13.25 | 6.00 | 16                              | 160.00 |
| No. 836.                            | Teinturier Mâle               | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 13 | 200.00 |       |      |                                 |        |

\* Fermented together.

1888. DATA REGARDING GRAPES WORKED IN THE VITICULTURAL LABORATORY—Continued.

| Variety.                                                  | Grower and Place of Production.            | Date of Crushing Grapes | Weight of Grapes in lbs. | Percentage of Pomace | Percentage of Stems | Gallons of Must Resp. Murk | Gallons of Must per Ton of Grapes |
|-----------------------------------------------------------|--------------------------------------------|-------------------------|--------------------------|----------------------|---------------------|----------------------------|-----------------------------------|
| <b>Bordeaux Type—Continued.</b>                           |                                            |                         |                          |                      |                     |                            |                                   |
| No. 832. Gamay Teinturier                                 | J. Gallegos, Expt'l Plot, Mission San José | Sept. 13                | 40.00                    | 10.00                | 5.00                | 3½                         | 162.50                            |
| No. 910. St. Macaire                                      | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 12                 | 96.50                    | 15.54                | 5.18                | 7%                         | 152.85                            |
| <b>Burgundy Type.</b>                                     |                                            |                         |                          |                      |                     |                            |                                   |
| No. 834. Pinots                                           | J. Gallegos, Expt'l Plot, Mission San José | Sept. 13                | 41.00                    | 13.41                | 7.31                | 3                          | 146.35                            |
| No. 837. Pinots (½ Pinot de Fernant, ½ Pinot St. Georges) | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 14                | 132.00                   | 15.91                | 6.05                | 10                         | 151.51                            |
| No. 846. Franc Pinot                                      | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 14                | 77.50                    | 16.13                | 6.45                | 6                          | 154.84                            |
| No. 847. Pinot Noirien                                    | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 14                | 76.50                    | 14.71                | 6.54                | 6                          | 156.88                            |
| No. 844. Meunier                                          | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 14                | 67.00                    | 16.05                | 6.72                | 5½                         | 156.72                            |
| No. 870. Chauché Noir (long-pruned)                       | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 28                | 188.00                   | 10.65                | 4.52                | 16½                        | 171.54                            |
| No. 909. Pfeffer's Cabernet                               | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 12                 | 125.00                   | 15.00                | 4.39                | 10%                        | 170.00                            |
| <b>Italian Type.</b>                                      |                                            |                         |                          |                      |                     |                            |                                   |
| No. 905.* Bonarda (1)                                     | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 11                 | 22.50                    | 13.10                | 4.43                | 6%                         | 157.74                            |
| No. 905.* Bonarda (2)                                     | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 11                 | 61.50                    | 12.50                | 5.69                | 4%                         | 149.20                            |
| No. 933. Nebbiolo Fino                                    | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 24                 | 62.00                    | 11.61                | 5.65                | 12%                        | 164.52                            |
| No. 919. Fresa (long-pruned)                              | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 19                 | 155.00                   | 11.11                | 4.32                | 6%                         | 162.90                            |
| No. 861. Barbera                                          | E. W. Hilgard, Mission San José            | Sept. 25                | 81.00                    | 9.27                 | 4.30                | 12½                        | 147.62                            |
| No. 861a. Barbera                                         | E. W. Hilgard, Mission San José            | Sept. 28                | 151.00                   | 14.76                | 5.71                | 3½                         | 155.00                            |
| No. 915. Barbera                                          | E. W. Hilgard, Mission San José            | Oct. 18                 | 52.50                    | 13.00                | 5.60                | 3%                         | 174.11                            |
| No. 925. Barbera                                          | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 23                 | 50.00                    | 11.19                | 4.02                | 9%                         | 178.57                            |
| No. 866. Crabb's Black Burgundy                           | E. W. Hilgard, Mission San José            | Sept. 20                | 112.00                   | 9.30                 | 3.57                | 13½                        | 157.22                            |
| No. 907.* Crabb's Black Burgundy (short-pruned)           | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 12                 | 14.00                    | 17.01                | 3.81                | 7%                         | 154.41                            |
| No. 908.* Crabb's Black Burgundy (long-pruned)            | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 12                 | 136.50                   | 16.76                | 4.12                | 13%                        | 162.71                            |
| <b>Southern French Type.</b>                              |                                            |                         |                          |                      |                     |                            |                                   |
| No. 872. Trousseau                                        | Margherita Vineyard, Fresno                | Oct. 1                  | 97.00                    | 11.53                | 4.07                | 14%                        | 171.74                            |
| No. 873. Trousseau                                        | J. T. Doyle, Cupertino                     | Oct. 2                  | 170.00                   | 10.99                | 6.45                |                            |                                   |
| No. 843. Ploussard                                        | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 14                | 147.50                   |                      |                     |                            |                                   |
| No. 890.* Petite Sirah (short-pruned)                     | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 9                  | 38.00                    |                      |                     |                            |                                   |
| No. 891.* Petite Sirah (long-pruned)                      | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 9                  | 108.50                   |                      |                     |                            |                                   |

\*Fermented together.



## Southern French Type—Continued.

|                                     |                          |                                            |          |        |       |      |     |        |
|-------------------------------------|--------------------------|--------------------------------------------|----------|--------|-------|------|-----|--------|
| No. 920.                            | Sérine                   | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 19  | 106.50 | 13.61 | 7.04 | 8   | 150.23 |
| No. 888.                            | Mondeuse                 | E. W. Hilgard, Mission San José            | Oct. 9   | 139.50 | 13.62 | 6.09 | 10% | 155.76 |
| No. 913.                            | Mondeuse                 | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 12  | 142.50 | 14.04 | 7.02 | 12  | 168.42 |
| No. 921.                            | Mataro                   | J. Gallegos, Expt'l Plot, Mission San José | Oct. 20  | 93.00  | 11.93 | 5.37 | 8%  | 185.48 |
| No. 916.                            | Cinsaut                  | J. Gallegos, Expt'l Plot, Mission San José | Oct. 19  | 122.50 | 6.53  | 2.86 | 10% | 177.55 |
| No. 922.                            | Cinsaut                  | E. W. Hilgard, Mission San José            | Oct. 20  | 110.00 | 8.64  | 3.64 | 10% | 184.09 |
| No. 950.                            | Cinsaut                  | J. T. Doyle, Experimental Plot, Cupertino  | Nov. 7   | 108.00 | 13.89 | 3.70 | 9%  | 168.98 |
| No. 955.                            | Aramon                   | J. T. Doyle, Experimental Plot, Cupertino  | Nov. 9   | 114.50 | 13.97 | 5.24 | 8%  | 158.02 |
| No. 944.                            | Petit Bouschet           | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 26  | 114.50 | 13.10 | 7.86 | 7%  | 128.82 |
| No. 831.                            | Grenache                 | Margherita Vineyard, Fresno                | Sept. 10 | 242.00 | 9.91  | 3.71 | 18% | 154.96 |
| No. 871.                            | Grenache                 | J. T. Doyle, Experimental Plot, Cupertino  | Sept. 28 | 163.00 | 8.43  | 6.42 | 13% | 162.97 |
| No. 945.                            | Mourastel (long-pruned)  | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 26  | 106.00 | 8.02  | 6.90 | 8%  | 165.09 |
| <b>Austrian and Hungarian Type.</b> |                          |                                            |          |        |       |      |     |        |
| No. 851.                            | Zinfandel (first crop)   | A. Caminetti, Jackson, Amador Co.          | Sept. 18 | 63.00  | 13.49 | 5.16 | 5%  | 166.66 |
| No. 852.                            | Zinfandel (second crop)  | A. Caminetti, Jackson, Amador Co.          | Sept. 18 | 54.50  | 11.93 | 5.50 | 4%  | 174.31 |
| No. 923.                            | Zinfandel (second crop)  | Margherita Vineyard, Fresno                | Oct. 22  | 146.50 | 10.75 | 3.75 | 11% | 162.12 |
| No. 911.*                           | Grossblau (short-pruned) | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 12  | 49.00  | 8.48  | 5.10 | 13% | 163.64 |
| No. 912.*                           | Grossblau (long-pruned)  | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 12  | 116.00 |       | 3.45 |     |        |
| <b>Port Type.</b>                   |                          |                                            |          |        |       |      |     |        |
| No. 889.                            | Bastardo                 | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 9   | 168.00 | 10.71 | 5.36 | 14% | 168.16 |
| No. 884.                            | Tinta Madeira            | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 5   | 93.50  | 9.09  | 5.88 | 8   | 171.13 |
| No. 936.                            | Tinta Amarella           | J. T. Doyle, Experimental Plot, Cupertino  | Oct. 24  | 153.00 | 9.15  | 5.88 | 12% | 168.80 |
| No. 956.                            | Tinto Cao                | J. T. Doyle, Experimental Plot, Cupertino  | Nov. 9   | 67.00  | 20.15 | 7.46 | 5%  | 151.12 |
| <b>Bordeaux Type.</b>               |                          |                                            |          |        |       |      |     |        |
| No. 1114.                           | Malbeck                  | Juan Gallegos, Mission San José            | Oct. 2   | 80.00  | 11.30 | 5.00 | 5%  | 140.60 |
| No. 1107.                           | Cabernet Franc           | J. T. Doyle, Cupertino                     | Sept. 27 | 85.50  | 15.80 | 5.20 | 61% | 156.40 |
| No. 1113.                           | Cabernet Sauvignon       | E. W. Hilgard, Mission San José            | Oct. 2   | 52.50  | 15.20 | 5.60 | 4%  | 168.60 |
| No. 1190.                           | Gros Verdot              | J. T. Doyle, Cupertino                     | Oct. 9   | 85.50  | 13.40 | 3.50 | 7%  | 173.80 |
| No. 1167.                           | Fannat                   | J. T. Doyle, Cupertino                     | Oct. 15  | 120.50 | 13.90 | 6.00 | 9%  | 161.80 |
| No. 1109.                           | Merlot                   | J. T. Doyle, Cupertino                     | Sept. 27 | 95.50  | 16.70 | 5.70 | 7%  | 159.70 |
| No. 1120.                           | Merlot                   | Juan Gallegos, Mission San José            | Oct. 2   | 71.50  | 7.70  | 4.90 | 54% | 162.60 |
| No. 1058.                           | Gamay Teinturier         | Juan Gallegos, Mission San José            | Sept. 12 | 173.50 | 13.20 | 5.00 | 11% | 135.50 |
| No. 1140.                           | Gros Mansenc             | Juan Gallegos, Mission San José            | Oct. 4   | 119.50 | 13.00 | 2.90 | 10% | 177.80 |
| No. 1159.                           | St. Macaire              | J. T. Doyle, Cupertino                     | Oct. 10  | 97.50  | 14.30 | 6.40 | 7%  | 162.70 |
| No. 1179.                           | St. Macaire              | J. Gallegos, Mission San José              | Oct. 17  | 92.00  | 15.50 | 7.90 | 64% | 148.10 |
| No. 1153.                           | Afenthaler               | J. T. Doyle, Cupertino                     | Oct. 10  | 80.00  | 14.00 | 7.50 | 6%  | 161.20 |

\* Fermented together.

1889. DATA REGARDING GRAPES WORKED IN THE VITICULTURAL LABORATORY—Continued.

| Variety.                                    | Grower and Place of Production. | Date of Crushing Grapes.... | Weight of Grapes in lbs..... | Percentage of Pomace..... | Percentage of Stems..... | Gallons of Must Resp. Murk... | Gallons of Must per Ton of Grapes..... |
|---------------------------------------------|---------------------------------|-----------------------------|------------------------------|---------------------------|--------------------------|-------------------------------|----------------------------------------|
| <b>1889.</b>                                |                                 |                             |                              |                           |                          |                               |                                        |
| <b>Burgundy Type.</b>                       |                                 |                             |                              |                           |                          |                               |                                        |
| No. 1074. Blauer Burgunder                  | J. T. Doyle, Cupertino.         | Sept. 19                    | 576.25                       | 16.80                     | 5.70                     | 42½                           | 146.90                                 |
| No. 1077. Pinot Noirien                     | J. T. Doyle, Cupertino.         |                             |                              |                           |                          |                               |                                        |
| No. 1078. Franc Pinot.                      | J. T. Doyle, Cupertino.         |                             |                              |                           |                          |                               |                                        |
| No. 1079. Pinot de Pernant                  | J. T. Doyle, Cupertino.         |                             |                              |                           |                          |                               |                                        |
| No. 1080. Pinot de Pernant                  | J. T. Doyle, Cupertino.         |                             |                              |                           |                          |                               |                                        |
| No. 1063. Pinot St. Georges                 | J. Gallegos, Mission San José   | Sept. 12                    | 45.00                        | 14.50                     |                          | 3½                            | 141.70                                 |
| No. 1061. Franc Pinot                       | J. Gallegos, Mission San José   | Sept. 12                    | 35.50                        | 16.90                     | 5.60                     | 2½                            | 148.00                                 |
| No. 1060. Pinot de Pernant                  | J. T. Doyle, Cupertino.         | Oct. 10                     | 112.50                       | 14.60                     | 4.90                     | 9%                            | 163.30                                 |
| No. 1062. Pfeiffer's Cabernet (Robin Noir). | J. T. Doyle, Cupertino.         | Sept. 12                    | 37.00                        | 13.50                     | 4.80                     | 2½                            | 155.50                                 |
| No. 1062. Meunier                           | J. Gallegos, Mission San José   | Sept. 12                    | 37.00                        | 13.50                     | 4.80                     | 2½                            | 155.50                                 |
| No. 1087. Chauché Noir                      | J. Gallegos, Mission San José   | Sept. 19                    | 71.00                        | 13.40                     | 4.30                     | 5%                            | 158.50                                 |
| <b>Italian Type.</b>                        |                                 |                             |                              |                           |                          |                               |                                        |
| No. 1072. Barbera.                          | E. W. Hilgard, Mission San José | Sept. 17                    | 843.75                       | 11.35                     | 3.90                     | 73½                           | 173.50                                 |
| No. 1132. Barbera.                          | J. T. Doyle, Cupertino.         | Oct. 3                      | 109.00                       |                           | 4.13                     | 8½                            | 158.30                                 |
| No. 1145. Fresa.                            | J. T. Doyle, Cupertino.         | Oct. 4                      | 137.00                       | 13.70                     | 3.80                     | 5½                            | 168.80                                 |
| No. 1149. Bonarda                           | J. T. Doyle, Cupertino.         | Oct. 9                      | 98.25                        | 12.50                     | 4.90                     | 8%                            | 172.20                                 |
| No. 1163. Nebbiolo Fino                     | J. T. Doyle, Cupertino.         | Oct. 11                     | 63.00                        | 17.90                     | 5.70                     | 4½                            | 162.70                                 |
| No. 1161. Spanna                            | J. T. Doyle, Cupertino.         | Oct. 11                     | 58.50                        | 15.80                     | 5.50                     | 4½                            | 158.10                                 |
| No. 1115. Crabb's Black Burgundy            | J. Gallegos, Mission San José   | Oct. 1                      | 95.00                        | 14.70                     | 3.70                     | 7%                            | 160.50                                 |
| No. 1128. Crabb's Black Burgundy            | J. T. Doyle, Cupertino.         | Oct. 3                      | 114.50                       |                           | 3.50                     | 9½                            | 159.40                                 |
| <b>Southern French Type.</b>                |                                 |                             |                              |                           |                          |                               |                                        |
| No. 1175. Aramon                            | Juan Gallegos, Mission San José | Oct. 16                     | 52.75                        | 11.24                     | 4.26                     | 4%                            | 175.40                                 |
| No. 1189. Aramon                            | J. T. Doyle, Cupertino.         | Oct. 18                     | 97.50                        | 11.54                     | 4.61                     | 8½                            | 173.08                                 |
| No. 1143. Cinsaut                           | E. W. Hilgard, Mission San José | Oct. 4                      | 151.00                       | 7.30                      | 1.30                     | 13½                           | 184.60                                 |
| No. 1151. Mondense                          | J. T. Doyle, Cupertino.         | Oct. 10                     | 89.00                        | 14.90                     | 6.50                     | 7½                            | 160.00                                 |
| No. 1141. Mourastel                         | Juan Gallegos, Mission San José | Oct. 4                      | 67.00                        | 11.90                     | 4.90                     | 5½                            | 166.00                                 |
| No. 1168. Mourastel                         | J. T. Doyle, Cupertino.         | Oct. 15                     | 80.25                        | 9.00                      | 5.00                     | 6½                            | 168.20                                 |
| No. 1198. Alicante Bouschet                 | J. T. Doyle, Cupertino.         | Oct. 24                     | 48.50                        | 18.04                     | 9.28                     | 3½                            | 152.06                                 |
| No. 1177. Petit Bouschet                    | J. Gallegos, Mission San José   | Oct. 16                     | 111.50                       | 12.33                     | 5.83                     | 9½                            | 168.16                                 |
| No. 1069. Ploussard                         | J. Gallegos, Mission San José   | Sept. 12                    | 61.75                        | 10.00                     | 3.58                     | 5½                            | 178.00                                 |
| No. 1042. Sérine                            | Margherita Vineyard, Fresno     | Sept. 6                     | 75.00                        | 19.00                     | 4.68                     | 5½                            | 148¼                                   |

## Southern French Type—Continued.

|                                     |                         |                                   |          |        |       |      |       |        |
|-------------------------------------|-------------------------|-----------------------------------|----------|--------|-------|------|-------|--------|
| No. 1116.                           | Sérine                  | J. T. Doyle, Cupertino.           | Oct. 1   | 115.00 | 13.14 | 5.47 | 11½   | 169.70 |
| No. 1147.                           | Sérine                  | J. Gallegos, Mission San José     | Oct. 9   | 97.50  | 15.90 | 6.20 | 7½    | 159.00 |
| No. 1055.                           | Trousseau               | A. Caminetti, Jackson, Amador Co. | Sept. 6  | 173.00 | 11.00 | 2.70 | 12½   | 148.90 |
| No. 1070.                           | Carignane               | A. Caminetti, Jackson, Amador Co. | Sept. 17 | 146.00 | 11.60 | 3.60 | 11½   | 161.00 |
| No. 1069.                           | Mataro                  | A. Caminetti, Jackson, Amador Co. | Sept. 16 | 119.00 | 16.40 | 3.00 | 11½   | 195.00 |
| <b>Austrian and Hungarian Type.</b> |                         |                                   |          |        |       |      |       |        |
| No. 1146.                           | Kadarkas                | J. T. Doyle, Cupertino.           | Oct. 4   | 57.50  | 8.70  | 5.20 | 5½    | 178.30 |
| No. 1057.                           | Blauer Portugueser      | Juan Gallegos, Mission San José   | Sept. 12 | 35.50  | 15.50 | 5.63 | 2½    | 155.00 |
| No. 1127.                           | Großeblau               | Juan Gallegos, Mission San José   | Oct. 2   | 45.50  | 12.00 | 3.30 | 3.85  | 172.50 |
| No. 1071.                           | Zinfandel               | A. Caminetti, Jackson, Amador Co. | Sept. 17 | 210.50 | 13.80 | 4.00 | 16.65 | 158.00 |
| No. 1098.                           | Zinfandel (first crop)  | Margherita Vineyard, Fresno       | Sept. 20 | 116.50 | 15.40 | 2.40 | 9.65  | 165.20 |
| No. 1099.                           | Zinfandel (second crop) | Margherita Vineyard, Fresno       | Sept. 20 | 115.50 | 17.00 | 2.20 | 9.50  | 163.60 |
| <b>Port Type.</b>                   |                         |                                   |          |        |       |      |       |        |
| No. 1178.                           | Tinto Cão               | Juan Gallegos, Mission San José   | Oct. 16  | 45.50  | 18.13 | 6.59 | 3¾    | 164.83 |
| No. 1117.                           | Tinta Amarella          | Juan Gallegos, Mission San José   | Oct. 1   | 59.50  | 12.20 | 4.20 | 4¾    | 163.80 |
| No. 1192.                           | Tinta Amarella          | J. T. Doyle, Cupertino.           | Oct. 18  | 75.00  | 12.14 | —    | 7¾    | 166.20 |
| No. 1118.                           | Tinta Madeira           | Juan Gallegos, Mission San José   | Oct. 2   | 55.50  | 10.00 | 6.80 | 4¾    | 175.70 |
| No. 1152.                           | Tinta Madeira           | J. T. Doyle, Cupertino.           | Oct. 10  | 97.00  | 11.60 | 5.20 | 8½    | 175.00 |
| No. 1086.                           | Bastardo                | J. Gallegos, Mission San José     | Sept. 19 | 62.00  | 13.70 | 4.00 | 4½    | 157.00 |

## APPENDIX I.

## THE SWEET WINE INVESTIGATION.\*

Professor Hilgard and assistants have concluded the experiments relative to the methods of determining the alcohol in sweet wines and the discussion of results.

The following may be given as its main points:

In his letter to Professor Hilgard, received on February 27th, the Commissioner assigns as the reason for the adoption of the "saccharometer method" that has given such alarmingly discrepant results with our sweet wines, that it was "desired to embody in the regulations some simple and approximate means for Internal Revenue officers to use in ascertaining roughly the alcoholic and saccharine strength of the wines the fortification of which they would be called upon to supervise." Elsewhere he states that the department chemists "have not, by this rough method, found a difference exceeding 2 per cent, and in most cases the results of the rough method are less than 1 per cent lower than by analysis."

In his reply, Professor Hilgard calls attention first to the fact that a much more accurate method, viz.: that of distillation (by the "Salleron" still) is in common use in every important winery in California, and to a considerable, perhaps excessive, extent forms part of the basis of bargain and sale of wines. That to put on record, officially, any widely discrepant determination of the alcoholic strength of a man's wines will disturb this basis and open the door to endless worry, contention, and possibly even legal difficulties, should any purchaser, or even a Government gauger, be disposed to harass the producer. He therefore concludes that the Government gauging ought in this, as in other respects, to be done with the utmost accuracy practically feasible.

That in its application to the young sweet wines at the time when fortification or refortification is called for, the Government method does not even approximately come within the limits of accuracy required, is then shown by a tabulated statement of the results of eighteen tests made by both methods, partly conjointly with the Deputy Collectors at the Internal Revenue Office, San Francisco, partly at the University Laboratory. Of the eighteen samples, one shows a difference of 3.6 per cent too low as compared with the "Salleron;" six show differences of over 3 per cent; thirteen show differences of over 2 per cent; and only three of less than 1 per cent. According to the accepted schedule, the wine-maker would, if these figures be admitted, have to make up such amounts by further fortification before his wines would be salable. It is true that, as stated by the Commissioner, the determinations of the deputies are not to be final, and doubtful cases would be referred to Washington for

\*From the "Pacific Rural Press," March 14, 1891.

revision by the chemists. But under the showing made, the Government method should possess very great advantages, not realizable by any other feasible one, to justify its retention.

This point is next taken up by Professor Hilgard; a number of causes of inaccuracy are shown to be irremediable in the application of the saccharometer method to young sweet wines, and also that no uniform coefficient of correction is applicable to all cases, although that of division by 8 applies to a great many. The Commissioner's objections to the "Salleron," or distillation method, are then discussed, his letter claiming it to "involve much more elaborate manipulations and calculations" than the saccharometer method. The fact that it is in general and satisfactory use by cellar-foremen throughout this State, that students learn to carry it out correctly in the laboratory within a single day, and that Deputy Collectors are not likely to be less intelligent, is adverted to; and as to the brevity claimed for the Government method, it is shown by actual timing to be far behind the still, at least two to one. In regard to the complex calculations claimed to be required when the distillation method is applied to sweet wines of high sugar contents, it is shown that the error in ports and sherries will not usually exceed six tenths of one per cent, and by the Government's own showing is therefore neglectable, and is ordinarily neglected in commercial transactions. But if it is desired to make the correction, it can readily be done without elaborate calculation by a "subtraction coefficient," dividing the sweet wines into three classes according to their sugar contents, and using for each a corresponding correction, by simple subtraction. The percentage results thus obtained are shown in parallel columns, and prove such close approximations, that outside of an analytical laboratory a better agreement would not be looked for. Professor Hilgard therefore concludes that while there is every reason for the rejection of the saccharometer method, no valid objection lies against the well-understood "Salleron;" and he accordingly hopes that the Commissioner will consent to the substitution.

The table below gives, in an abridged form, the data upon which the discussion is based. Columns 3, 4, and 5 show the discrepancies resulting from the use of the Government method; an inspection of columns 6 and 7 shows the close approximation that may be reached under the method recommended by Professor Hilgard:

## COMPARATIVE OBSERVATION ON THE DETERMINATION OF ALCOHOL IN SWEET WINES.

## 1. Observations at Internal Revenue Office, San Francisco.

| Grower.                           | 2.<br>Variety. | 3.<br>U. S.<br>Tables.<br>Alcohol by<br>Volume. | 4.<br>Salleron<br>Test.<br>Alcohol by<br>Volume. | 5.<br>Difference,<br>Direct. | Volume by Salleron.               |                                   |
|-----------------------------------|----------------|-------------------------------------------------|--------------------------------------------------|------------------------------|-----------------------------------|-----------------------------------|
|                                   |                |                                                 |                                                  |                              | 6.<br>Corrected<br>by<br>Formula. | 7.<br>Corrected<br>by<br>Constant |
| I. Sierra Madre Co., Lamanda Park | Port           | 19.29                                           | 21.99                                            | 2.70                         | 20.71                             | 21.09                             |
| II. H. C. Eggers, Fresno          | Port           | 17.98                                           | 19.59                                            | 1.61                         | 18.78                             | 18.69                             |
| III. P. O. Burns, San José        | Port           | 16.10                                           | 19.28                                            | 3.18                         | 18.48                             | 18.38                             |
| IV. Barton Estate Co., Fresno     | Port           | 20.64                                           | 22.18                                            | 1.54                         | 21.19                             | 21.28                             |
| V. Roscoe Winery, Los Angeles     | Sherry         | 17.23                                           | 20.24                                            | 3.01                         | 19.59                             | 19.61                             |
| VI. P. O. Burns, San José         | Angelica       | 16.48                                           | 19.28                                            | 2.80                         | 18.45                             | 18.38                             |
| VII. C. G. Anderson, Fresno       | Angelica       | 16.67                                           | 20.24                                            | 3.57                         | 19.39                             | 19.61                             |
| VIII. H. B. Wagoner, Livermore    | Port           | 20.45                                           | 21.19                                            | .74                          | 20.43                             | 20.59                             |
| IX. J. P. Smith, Livermore        | Angelica       | 15.00                                           | 17.70                                            | 2.70                         | 16.43                             | 16.70                             |

## 2. Observations at Experiment Station Laboratory.

|                                |             |       |       |      |       |       |
|--------------------------------|-------------|-------|-------|------|-------|-------|
| X. Gallegos Winery, Irvington  | Port        | 16.15 | 19.49 | 3.34 | 19.08 | 18.89 |
| XI. Gallegos Winery, Irvington | Port        | 13.77 | 17.20 | 3.43 | 16.60 | 16.60 |
| XII. Watson & Co., Oakland     | Port        | 15.73 | 18.22 | 2.49 | 17.59 | 17.62 |
| XIII. H. W. Crabb, Oakville    | Malvoisie   | 10.87 | 13.90 | 3.03 | 13.00 | 12.90 |
| XIV. H. W. Crabb, Oakville     | Malvoisie   | 10.87 | 13.80 | 2.93 | 13.01 | 12.90 |
| XV. University Cellar, 1889    | T. Madeira  | 16.29 | 16.43 | .14  | 16.03 | 15.83 |
| XVI. University Cellar, 1890   | T. Madeira  | 17.98 | 18.78 | .80  | 18.48 | 18.68 |
| XVII. University Cellar, 1889  | T. Amarella | 14.65 | 17.17 | 2.52 | 16.61 | 16.50 |
| XVIII. University Cellar, 1889 | Trousseau   | 16.10 | 18.25 | 2.15 | 17.52 | 17.65 |

## APPENDIX II.

### CARPENÉ'S NEW METHODS OF ANALYSIS OF THE RAW MATERIALS CONTAINING TARTRATES.

The importance that the industry of wines has attained at this time in California has led the people to begin to utilize some of the waste products of wine-making, such as the distillation of pomace and lees for brandy, and the extraction of cream of tartar from them.

To determine the commercial and industrial value of the raw materials used in the manufacture of tartrates, it is not only necessary to know the proportion of cream of tartar, calcium tartrate, and total tartaric acid, but also the quantity of certain other substances which may be mixed with the tartar must be determined.

The best methods of analysis to accomplish this end are those of an Italian specialist, Professor Carpené, which we give below for the use of chemists working for factories of cream of tartar:

*Determinations to be Made.*—In the analysis of a crude tartar the quantity of the following substances should be determined: sulphuric acid; free acids; phosphoric acid; cream of tartar; calcium tartrate; water; total tartaric acid.

*Taking of the Sample.*—The sample of material to be analyzed should represent, as nearly as possible, the average of the entire mass that is to be made use of. The sample should first of all be reduced to powder, and then passed through a very fine sieve.

1. *Determination of the Sulphuric Acid.*—This determination is made by means of barium chloride, according to the usual method described in all books on analytical chemistry; but the sulphates soluble in alcohol and water, and those soluble in hot chlorhydric acid (calcium sulphate), should be determined separately.

2. *Determination of the Free Acids.*—Free acids are rarely found in appreciable quantities in crude tartars. To determine them, 5 grams of the powdered tartar are taken and dried at a temperature of 110° C. until it ceases to lose weight. It is then treated with a mixture of neutral absolute alcohol and of neutral anhydrous ether in equal volumes, enough of the mixture being added to make 50 cubic centimeters. After having shaken up the liquid well, a small quantity of it is taken and treated with a few drops of a solution of phenolphthalein which has been reddened beforehand with a trace of alkali. This solution is very sensitive to infinitely small traces of acid, which cause its decoloration. If by this treatment a decided acidity is shown, 20 cubic centimeters of the filtered liquid are taken and diluted with an equal quantity of distilled water, and the acidity is determined by the same solution of hydrate of potassium which is used for the determination of the total amount of tartaric acid.

3. *Determination of the Phosphoric Acid.*—The ash of the substance is first tested for the absence of salts of iron or aluminum, in which case the determination of the phosphoric acid becomes a very simple matter. Five grams of the pulverized substance are incinerated in a platinum capsule. The residue is treated with a slight excess of chlorhydric acid and a few drops of a concentrated solution of calcium chloride, if the ash does not contain calcium carbonate. The liquid is filtered and treated with a slight excess of ammonia. The precipitate which is formed is collected on a plain filter, the weight of whose ash is known. It is then washed and ignited carefully in a platinum dish (weighed beforehand) and then weighed. The weight that is obtained after subtraction of the weight of the dish and of the ash, multiplied by 0.63226 (which represents the phosphoric acid,  $H_3PO_4$ , contained in a gram of calcium phosphate), gives the quantity of phosphoric acid contained in 5 grams of the substance.

For tartars that contain other salts that are precipitated with the calcium phosphate, Carpené uses the following modification of the above method:

After washing the precipitated impure tri-calcic phosphate on the filter, it is re-dissolved in boiling water strongly acidulated with chlorhydric acid. The liquid is measured, care being taken that it does not exceed 60 cubic centimeters. To this is

added from 0.3 to 1 gram of pure dry tartaric acid, weighed exactly, the quantity to be approximately double that of the phosphoric acid contained in the tartar. When the tartaric acid is dissolved in the 60 c.c., 20 c.c. are taken and evaporated to dryness in a platinum capsule on the water-bath, the evaporation being continued for about two hours, in order to drive off all the chlorhydric acid. The residue in the capsule is re-dissolved in distilled water, enough being used to make a volume of 50 c.c. In this solution the free phosphoric acid is determined by the same solution of potassium hydrate described in the following paragraph 4, which, however, must be previously titrated with pure phosphoric acid. A part of the 50 c.c. is poured into a Mohr burette; and in a small beaker is poured 10 c.c. of the titrated alkaline solution; into this the liquid in the burette is allowed to drop slowly; the dropping is stopped as soon as the alkaline liquid colored by the phenolphthalein (see paragraph 4) is completely decolorized. Supposing that 10 c.c. of the alkaline solution represent 0.0638 grams of phosphoric acid and 0.036 grams of tartaric acid, it is easy to calculate the quantity of phosphoric acid contained in the liquid.

If, for example, the tartaric acid contained in 20 c.c. corresponds to the saturation of 8.365 of the titrated alkaline solution, the 1.635 c.c. that remain to complete the 10 c.c. employed were saturated by the phosphoric acid.

This method in many cases is preferable to other longer and more delicate ones.

4. *Determination of the Cream of Tartar.*—Five grams of the powder to be analyzed are taken and treated with boiling distilled water in sufficient quantity to form 500 c.c. The liquid is shaken thoroughly in order to insure the complete solution of the cream of tartar, then a little of this solution is filtered and put into a Mohr burette. In a beaker is placed a titrated solution of potassic or sodic hydrate reddened by the addition of a few centigrams of phenolphthalein—one of the surest and most sensitive indicators.

The tartaric solution is poured drop by drop into the glass containing the titrated solution until the latter is decolorized; having the number of cubic centimeters employed, a simple calculation will show the quantity of cream of tartar. The potash solution is prepared by dissolving 8 to 10 grams of the hydrate in a liter of distilled water; the solution is colored with the phenolphthalein and preserved in a well-closed flask out of contact with the light; 0.2 grams of pure and dry bitartrate of potash are weighed out, dissolved in 50 c.c. of water, and poured into the burette; 10 c.c. of the solution to be titrated are placed in a beaker and the tartaric solution allowed to fall drop by drop into it until the last drop completely decolorizes the alkaline solution. Supposing that 15.3 c.c. have been needed to decolorize, the 10 c.c. of the alkaline solution represent 0.0612 of cream of tartar. Tartars are often rich in coloring matter, in which case part of the tartaric solution must be decolorized by pure animal charcoal, that is to say, freed from all mineral salts they may contain. To purify the charcoal it is treated with warm chlorhydric acid and then well washed with distilled water on a filter until the water does not redden litmus paper. In general, a spoonful of this charcoal suffices for 100 c.c. of the tartaric solution. It is well shaken and then filtered.

As animal charcoal retains traces of cream of tartar, the first half of the uncolored liquid that filters through is rejected and the determination made with the second half.

If the crude tartar contains free acids in appreciable quantities, it is necessary to calculate how much cream of tartar corresponds to the amount of free acids found, and subtract it. The calculation is easily made, knowing that 1 gram of cream of tartar ( $C_4H_6O_6K$ ) contains 0.7973 of a gram of tartaric acid. In general, the quantity of free tartaric acid in crude tartars is too small to be taken into account.

5. *Determination of Calcium Tartrate.*—The quantity of calcium tartrate is deduced from the per cent of tartaric acid (paragraph 8). The per cent of cream of tartar being obtained, it is multiplied by 0.7973. If the quantity of the total tartaric acid shown is greater than that contained in the cream of tartar, the excess is the tartaric acid of the calcium tartrate. This divided by 0.5769 gives the per cent of calcium tartrate. The factor 0.5769 represents the tartaric acid contained in 1 gram of pure calcium tartrate ( $C_4H_4O_6Ca+4^{aq}$ ).

6. *Determination of the Water.*—To gain time, this determination can be made with the same sample that is dried at  $110^\circ C$ . for the determination of the free acids (paragraph 2). Five grams of the substance are taken, weighed, and heated on the air-bath. When it ceases to lose weight, it is weighed, and the quantity of water contained in the 5 grams calculated from the amount of loss.

7. *Substances not Determined.*—These are obtained by difference; that is to say, the per cent needed to make up 100 per cent will represent their amount.

8. *Determination of the Total Tartaric Acid.*—Five grams of the substance to be analyzed are weighed out and treated with about 10 c.c. of chlorhydric acid diluted with an equal volume of water. It is then heated to complete the transformation of the cream of tartar and calcium tartrate into calcium chloride, potassium chloride, and tartaric acid, which remains in the free state. By the addition of water the bulk is increased to 300 c.c.; a part of this is filtered and if necessary decolorized with animal charcoal. Of this liquid, 10 c.c. are taken and poured into the platinum capsule, a few drops of a concentrated solution of calcium chloride being added. It is evaporated to dryness on the water-bath, the operation being prolonged for about two hours in order to expel all the chlorhydric acid. The exact quantity of tartaric acid is found by means of the titrated solution of potassic hydrate. For this determination the same alkaline liquid is used as served for the cream of tartar, but it must be titrated beforehand with pure dry tartaric acid. One tenth of a gram is dissolved in enough distilled water to



make 50 c.c.; then this tartaric acid solution is allowed to run drop by drop into the alkaline, which is kept stirred, until decolorized; supposing that it required 12.5 c.c., then we have the solution representing 0.025 gram of tartaric acid for each 10 c.c. The residue in the capsule is redissolved in distilled water, making 50 c.c. of the solution, which is poured into a Mohr burette and let run drop by drop into the alkaline solution until it decolorizes it. The number of cubic centimeters used is noted, and by a simple calculation the total tartaric acid is found. It must, however, be remembered that if the tartar contains phosphates, the phosphoric acid remains also free, so that we will obtain a result larger than the true contents of tartaric acid. If the quantity of phosphoric acid is less than 0.2 per cent it may be disregarded; but if the quantity is greater it should be subtracted from the tartaric acid. This is easily done when the amount of phosphoric acid contained in the original substance and the strength of the alkaline solution (see paragraph 3) are known.

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